

A HISTORY OF AGRICULTURAL UNIVERSITIES

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by
K. C. NAIK
Vice-Chancellor
The University of Agricultural Sciences, Bangalore

and

A. SANKARAM
Regional Executive,
The Fertilizer Association of India, Madras



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FOREWORD

It is not without significance that the sixties saw the beginnings of a breakthrough in our agricultural production as well as the evolution of a new system of agricultural education and extension in this country. In fact, these two developments were intimately interconnected. As one who had the privilege to play a role at the national level in this process of change, I can say that without the reforms that were taken on hand at that time in the system of our agricultural education and in our extension machinery, it would have been difficult to achieve the sizeable improvement in per-acre crop yields that has been witnessed in recent years.

Agriculture has been the oldest as well as the dominant profession in our country for centuries. Yet, even though we produced some brilliant individual scientists, we did not have effective institutional arrangements till the sixties either for a continuous review and improvement of our agricultural technology or even for spreading the best among the *known* technologies to the farmers along the length and breadth of this country. Agricultural sciences received but peripheral attention as part of the overall teaching and research efforts in the life sciences in the general universities. The communication gap between scientists, agricultural administrators and farmers had to be overcome before any real breakthrough from the stagnating equilibrium that characterised the previous decades could be planned.

This book by Dr. K.C. Naik and Dr. A. Sankaran, an enlargement of a previous book on the same subject by Dr. K.C. Naik, makes a commendable attempt to trace the evolution of agricultural education system in the country with special emphasis on some of the basic structural changes that have been effected in recent years. This is a timely work, covering a fairly comprehensive field connected with different aspects of agricultural universities in the country and should be of use

not only to agricultural scientists but to all those connected with organisation of scientific institutions in developing countries with special reference to agriculture. Governmental agencies as well as enlightened readers will also find material of interest and use to them in this book. I congratulate the authors on their painstaking effort and hope that the book will receive the wide and careful attention it deserves.

(C. SUBRAMANIAM)
Minister of Planning,
Science & Technology,
Government of India,
New Delhi.

December 6, 1971

P R E F A C E

There is not a single phase of human activity that is not influenced in some measure by the revolutionary progress of science and technology nor is there any single country which is averse to bring about technological change in agriculture for attainment of economic stability to strengthen and sustain political independence. India is no exception to this and the period of a decade (1960-71) can be singled out as revolutionary in modernising agricultural production on a scale unprecedented in history. The dimensions of the problem can be appreciated by the fact that current agricultural production in India, if used on standard nutritional basis, no less than 125 million people will have to go without food.

The realisation of the fact that in agriculture, unlike in non-agricultural sectors, there is a possibility for very substantial increase in efficiency in the use of existing capital is dawning on India. Increased resources are necessary, but the proper utilisation of available resources is no less important. To produce more food with better use of existing resources and to secure additional resources needed for modern technology, increased education and better skills, become possible only under a reorganised set up where efficiency of operation is as vital as the know-how. The elimination of numerous defects associated with primitive farming practices descended from father to son over centuries, cannot be done away by administrative fiat or by proliferation of the staff at the Centre, State, or field level. Nor can dramatic results be expected through a few massive irrigation projects, outsized State farms, or larger imports of fertilisers. Even these can make the expected impacts on production only when adequate and efficient extension education programmes are available and are backed by a regular flow of new and profitable technology from problem oriented research. In the ultimate analysis higher agricultural production can only be achieved through use of highly rewarding inputs which must arise from adaptive research carried out by devoted

scientists who are trained for the purpose in well organised institutes of education.

Appropriately, India has embarked on a reform of her educational, research and extension organisation through the establishment of agricultural universities modelled roughly on the Land-Grant Pattern of US. This reform from a traditional and British conceived system to a new concept, more or less in harmony with the modern US system was brought about in a phenomenally short period. Apart from the necessity of the times, the wider acceptance was more due to vast social and economic changes that have occurred in the minds of both the people and the Government of the largest democracy of the world, in the post-independence period, all in an effort to raise the living standards.

Agricultural education and research in India of the past has a long history, part of which have been recorded at intervals but a connected account is conspicuous by its absence. Recent phenomenal transformations during the past decade, which produced fruitful results are undoubtedly of special significance. The transformation from the old to the new has not been smooth in any way and a variety of puzzling experiences were encountered. A connected account of all this if made available could be read and understood by nationals in other developing nations who have started along this line but who have yet to conquer many of the problems already confronted in India, would no doubt be of value. Educational and political leaders of countries with problems very similar to those in India may in particular be able to profit from the Indian experience.

The anomaly of the general reader having presently an easier access to the history of almost any minor event of numerous wars within and outside India than to the history of agricultural education in India, is patent. The need for an anthology of discussion about education in agricultural sciences in India throughout the recorded history is also manifest.

In order to aid the cause of International understanding by the provisions of information in this important aspect of nation's growth through education and research in agricultural

sectors which affects the largest number of people in every country. Mr. J.A. Rigney and Dr. I.L. Baldwin of the CIC-USAID Rural Development Research Project invited the senior author to analyse the history of the development of agricultural universities in India, to look closely at institution building projects across cultural, political and personality configurations in order to distil basic principles, experiences and important insights that cut across these constraints and thereby, become useful in planning future activities.

The arduous work undertaken resulted in publication of the book under the caption "A History of Agricultural Universities". It is designed to fulfil the following objects viz, (i) providing a history of education in agricultural sciences in India with reference to the origin, development and functions of agricultural universities, (ii) to chart the currents and cross-currents which have marked the development of higher education in agricultural sciences since the days the British-ruled India, and (iii) to encompass over a century the literature of the controversy and discussion reflecting the social and material hopes of the farmers, administrators, educators and planners.

The book was well received in India, USA and some of the developing nations. Hardly within a short period of eighteen months the edition was out of print and further demand for it from several sources was on the increase. It is at this stage the senior author decided that a mere reprint of the book would *serve no purpose and would even be stale, in the context of sweeping changes of sufficient significance which have occurred in the growth of the institutions in different patterns in various states of the country.* A thorough revision of the work appeared both voluminous and highly taxing without able and effective assistance being available to the senior author. To this end, the choice of the senior author could not have possibly been better than in Dr. A. Sankaram, whose long experience as a teacher with a versatile pen could hardly be *matched by any one in the country.*

The revised and enlarged edition of the book was planned with meticulous care to retain the objects of the first edition and provide further authoritative and useful material to widen the

basis so as to achieve additional objectives viz., (i) to bring into sharper focus of the sensitive areas of the problems of the teacher and the student where curative measures are possible under the new concept and philosophy of the agricultural universities, (ii) in providing an anatomy of technical assistance suggests new approaches for it to be more effective and rewarding, and (iii) to provide guidelines for institution building towards maturity.

In our endeavours to achieve the said objectives the job appeared to be neither simple nor pleasant. We are aware that at some places in the text, experiences of the Indian situation given in a candid way might appear rude and provoke opposition from some readers. But the approach, we assure, was not with malice towards any specific case, institution or policy. It is necessary for us to emphasise that in stock-taking the deficiencies and liabilities need some emphasis and closer examination, than to be merely contended with a sense of pride for the few and meagre achievements. In an innovation of measures to deal with the deficiencies lies the crux of achieving progress in agriculture. Further, if such sensitive areas of deficiency are soft peddled or skipped off, it would be a disservice to the cause of development of the new institutions by not giving an opportunity to correct and strengthen the weak spots. An emphasis on the deficiencies may therefore be justifiable but we have taken all care for falsehood not to appear in any form.

During the short period of three years since the publication of the first edition many of the developments have been very encouraging to us. Of these the desultory remarks by various intellectuals turned to be totally ineffective. At least some of the institutions that have registered such phenomenal and healthy growth deserved the name, "Agricultural University". The good beginning that is made, is small, but effective to take the project beyond the point of no return. The challenge is obviously to make better use of the experience gained to improve the performance and extend it over other areas. The set up of two more new universities, at the time this book was in press has accelerated our faith and optimism in the success of the new system of integrated education, research and extension.

The inspiration and support generously lent by Mr. J.A. Rigney and Dr. I.L. Baldwin and the valuable editorial comments of Dr. F.W. Parker and Dr. R.W. Cummings to Dr. Naik, for the first edition of this work, is now shared by the junior author as a unique opportunity of high educative value.

A work such as this depends upon the close cooperation of many persons, Vice-Chancellors, Deans, Registrars, other key officials of Agricultural Universities and also the officers connected with the Indian Council of Agricultural Research, the Indian Agricultural Research Institute, U.S. Agricultural Universities, staff of many affiliated and constituent colleges of agricultural sciences. We are deeply indebted to all of them in various ways for providing the information asked for. We are specially grateful to Dr. Pollock of USAID; Dr. Worrall of Ford Foundation; and Dr. Baird of The Rockefeller Foundation for all the information given at our request.

Apart from the encouragement and blessings, given for the fruition of our endeavours we sincerely feel that agricultural education, research and extension of the entire country received high recognition and valuable support at the hands of Sri C. Subramaniam, Union Minister for Planning through his inspiring Foreword to the book. For this we express our deep-sense of gratitude to him. Our sincere thanks are due to Prof B.V. Venkata Rao, Secretary, Publications Council, UAS, Bangalore for his most generous help in proof reading as an additional check up ; but we still take the responsibility for any errors still left out. Special thanks are due to our publishers, Messrs Oxford & IBH Publishing Co., New Delhi for speedy and neat execution despite odds.

We are aware of the shortcomings of our study that envisaged to encompass in time, physical area and the numbers involved by the subject. Although we have taken great care to cover all aspects of the subject in depth and area ; yet there might be spots untouched. If any such area that deserves a place in history are brought to our notice, we appreciate and assure our gratitude to them.

If what we have presented in the book partly or wholly fulfils its object and turns out to be useful to those to whom it is addressed, we feel amply rewarded for the effort made. Only one desire remains. We sincerely wish to see for ourselves the growth to maturity of all the institutions described here so that we have an early opportunity to rewrite the progress and achievements with greater pride and satisfaction, even if, what Benjamin Franklin said comes true : "If a man could have half his wishes he would double his troubles".

December 1971

K.C. NAIK
A. SANKARAM

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1. Introduction

Ancient and Mediaeval Colleges and Universities

THE report of the University Education Commission (1948-49) headed by Dr. S. Radhakrishnan, who latter became the President of India, contains a vivid account of higher education in India upto 1857*. These ancient and mediaeval centres of learning, says the Commission, contributed very little to the Universities of modern India. It is, however, recorded in the report that Taksasila University had a curriculum which included eighteen arts, including medicine, surgery, astronomy, agriculture, accountancy, archery, astrology and snake charming. This University flourished as an educational centre till the fifth century A.D., while Nalanda University was destroyed towards the close of the twelfth century.

The mediaeval college and Universities established by Mohammedan rulers were mainly concerned with the teaching of Arabic and Persian literature and the curriculum paralleled, according to the University Education Commission, the *trivium* and *quadrivium* of the European institutions and included grammar, rhetoric, logic and law, geometry and astronomy, natural philosophy, metaphysics and theology. Most of these institutions have disappeared, although some still carry on the tradition of these colleges and are better known as Madrasahs.

Early British Attempts

One of the noteworthy acts of Warren Hastings, the first Governor-General of British India, was to establish the Calcutta Madrasah intended "to qualify the sons of Mohammadan gentlemen for responsible and lucrative offices in the State". The next important educational institution established by the British was at Banaras "for the preservation and cultivation of laws,

* The Report of the University Education Commission : (1951).
Manager of Publications, Government of India, New Delhi.

literature and religion of the nation, to accomplish the same purpose for the Hindus as the Madrasah for the Mohammedans and specially to supply qualified Hindu assistants to European Judges". In 1792-93 the British Parliament debated on a resolution to send out to India school masters and missionaries, but this is reported to have been opposed by one of the Directors of the East India Company with the argument that "they had just lost America from their folly in having allowed the establishment of school and colleges and it would not do for them to repeat the same act of folly in regard to India". In 1811, Lord Minto's minute regretted the neglect of literature and science in India and two years later a clause was inserted in the charter of the East India Company stipulating that "a sum of not less than one lakh of rupees in each year shall be set apart and applied to the revival and improvement of literature and for the introduction and promotion of knowledge of the sciences among the inhabitants of the British territories in India." In a few years, the Court of Directors of the Company approved the efforts to raise a class of persons qualified for high employment in the civil administration of India.

Founding of Colleges

This objective of "preparing natives for public employment" continued to be the motive force leading to the founding of colleges. This was followed by the establishment of colleges by various Christian missions. The Serampore College established in 1818 obtained a charter from the Danish King (it being a product of the work of Danish missionaries) in 1827 raising it to the status of University and giving it the power to confer degrees. But it was only towards the end of 1856 that the Government of India approved the general plan for the establishment of three Universities at Calcutta, Madras and Bombay from 1857.

Although the Government had intended a gradual withdrawal of its management of colleges, this was found impracticable for many years; and in fact, new Government colleges had to be established. The Universities thus remained purely affiliating bodies on the model of London University. The Commission, however, remarks that "it is ironical that soon after the establishment of Indian Universities, London itself

gave up 'affiliation' and substituted for it constituent colleges and a system of open examinations without regard to the candidates' place of education". The Commission proceeds to remark that "As affiliating bodies the Universities made it their sole function to conduct examinations and to regulate the admission of candidates to these through a supervision of the places of instruction. Elaborate regulations were framed and the freedom of the teacher consequently curtailed".

A Government resolution on educational policy in 1913 indicated that India would not be able to dispense altogether with the affiliating Universities for a long time, but it was necessary to restrict the area over which such universities would have control and secondly, "to create new teaching and residential universities". The later type of universities were established at Dacca, Aligarh and Banaras.

Conditions in 1920s

Reviewing the conditions prevailing in India during 1920s, the Royal Commission on Agriculture in India concluded in 1928 that "however efficient an organisation might be built up for demonstration and propaganda, unless it was based on the solid foundations provided by research, it was merely a house built on sand". Even as recently as in 1936 and 1937 when Sir John Russel, Director of Rothamsted Experimental Station, visited India to review the condition of Indian agriculture, he reported that "in general, the men who actually till the soil are scarcely touched by the national programme of agricultural education".

Agricultural Colleges and Enrolment and Research Position in 1947

The development of education and research facilities in agriculture and related fields advanced rapidly in spite of the depression and war, so that by 1947 India had 17 colleges of agriculture with an annual enrolment of about 1500 students. In the case of research, its influence was felt upto 1947 largely in fields where industry directly infringed on agriculture, such as in cotton, through the activities of the Indian Central Cotton

* Report : Royal Commission on Agriculture in India (1928) Government of India Central, Publication Branch, Calcutta.

Committee, and in jute, sugar, lac, coffee, tea, rubber and tobacco. Particularly in sugar the progress was spectacular, and no less than 80 per cent of the sugarcane grown in India by 1947 was claimed to be under improved varieties, for which sugarcane research could claim credit. Improved varieties of wheat and rice were also released but had not made as much progress.

The major institutions functioning by 1947, besides the Indian (formerly Imperial) Council of Agricultural Research, were the Indian Institute of Fruit Technology at Lyalpur established in 1945, the Central Agricultural Marketing Department organised in 1934, the Imperial (now Indian) Bacteriological Laboratory founded in 1890 as the Indian Veterinary Research Institute, the Indian Dairy Research Institute started in 1923 and the Central Rice Research Institute founded in 1946. This list excludes the earlier research centres like the Pusa Institute and the Sugarcane Breeding Institute, Coimbatore.

Among the colleges of agriculture functioning by 1947, mention may be made of that at Coimbatore which was started in 1868 near Madras as a farm and raised to the status of a college in 1878 in its new location at Coimbatore to offer a diploma course, and to offer a degree course in 1920. The College of Agriculture, Poona, was started in 1879 as a branch of the College of Science, developed in 1890 to offer a diploma course, and in 1903 to offer a degree course. The Allahabad Agricultural Institute was founded in 1910 and was sponsored co-operatively by a number of churches and missions and currently prepares students for degree courses in agriculture, agricultural engineering and dairying. A more recent development was the introduction of post-graduate courses in agronomy and bio-chemistry.

Indian Examination System

The University Education Commission after reviewing the examination system in India has stated: "For merely half a century, examinations, as they have been functioning have been recognised as one of the worst features of Indian education". Among the many defects associated with the external examination system of traditional universities are: it is not reliable; it does not efficiently measure what it does measure; it is not

adequate; it does not sample sufficiently widely; it is not objective and does not effectively eliminate the bias or subjective opinion of the person who marks it; it has subjected teaching to the examination, made it almost impossible to provide true education and to develop wider interests, and has created temptation of cheating, corruption and favouritism. To sum up, the chief purpose of the examinations conducted under the traditional university is not organically related to the actual process of education. A university degree is the minimum requirement even for posts of minor officials and clerks and this fact has put a premium on a number of evils which have come to be associated with such a traditional system of examination.

In this context, it is now found that the introduction of valid, reliable, adequate, objective examinations is the hallmark of the new concept that is now being followed by the agricultural universities following broadly the pattern of the U.S. land grant system.

Other Defects of Indian Education System

Lack of high standards in education results in inordinately large annual wastage of public funds year after year, besides a terrible waste of time, energy and funds of students and their parents as well as considerable frustration. Under the affiliated system, the standards of teaching vary greatly from college to college as also the qualifications and competence of teachers, their salary scales and the interest, enthusiasm or dedication to teaching. Overcrowding in colleges, the mass lecture method of instruction with no provision for preparation for the lecture or by library work after the lecture, and which soon deteriorates to a mere dictation of notes, excessive dependence on text-books which are not always prepared with care, but which are sometimes prescribed on considerations other than academic, provision for certain categories of students to appear at public examinations without attending lectures at recognised institutions, tutorials whose main function is coaching for examinations, absence of seminars—these are some of the large number of evils associated with the type of education inherited from pre-independence era.

Comparison with the New Concept

The new concept that is followed in Agricultural universities is what has been evolved over a period of years in the hard school of experience and on the basis of a wealth of scientific work. The evaluation, testing, measurement and appraisal are all devised to the objective. The foundation for this new system of education and evaluation was laid in 1862 in the U.S. by an act of the Congress (Morrill Act) during a period when that nation was engaged in a bitter struggle. When Abraham Lincoln signed the Act on July 2, 1862, it contained provision of grants of land in the public domain to all the States of the Union for the establishment of colleges to teach agriculture, mechanic arts and military training without excluding humanities or classics. These land grants became the permanent endowments of what is now known as land grant colleges. They "constituted a programme of complete democratization of higher education for the masses, the introduction of science into the curriculum, with its applications, principally in agriculture". "In the years that followed, agricultural experiment stations were established within the land grant colleges, and later the Federal-State Extension system was added. The adult educational system reaching the farmers and their families from the laboratories, class rooms and experiment stations has made Norris E. Dodd, former Director General of the Food and Agriculture Organization, designate the U.S.A. as having the largest rural education agency in the world.*

The integration of resident teaching, research and extension education, the method of teaching to enable the students to solve problems rather than merely to acquire a degree as passport for a position, the internal, verifiable and continuous evaluation which prevents the need for memorization by students, are some of the characteristics that stand out in the U.S. land grant system, which the agricultural universities in India are endeavouring to adopt.

How the New System Came to be Introduced in India

Dr. Zakir Husain, former President of India in a very illu-

* Vaidyanathan, P.P.I. and Naik, K.C., *Agricultural Institutions in the United States of America* (1952), Superintendent, Government Press, Madras.

minating talk delivered in August 1964 at Bangalore revealed for the first time as to how the Radhakrishnan Commission came to recommend a far-reaching change in our education system.* He declared that the entire credit for introducing the new system into the exclusive and forbidding precincts of Indian higher education goes to Dr. Arthur E. Morgan of Tennessee Valley Authority fame. Dr. Morgan was well aware of Gandhi-ji's approach to place the neglected village at the centre of developmental thinking. He was aware of Tagore's village reconstruction work, and he had known the deep attachment of Nehru to modern science and his anxiety to transform the traditional to a rational outlook, and from empirical to scientific technology. With all this background, Dr. Morgan was able to persuade the Commission to accept his proposal for the establishment of Rural Universities in India. Many expert committees subsequently elaborated this concept, which is now well known as the concept of Agricultural Universities, the most singular feature of which is a complete break-away from the traditional University system.

These new *Agricultural Universities* have now been established with the approval of the Planning Commission and on the Central Government's initiative and sponsorship in eleven States of India—Uttar Pradesh, Punjab, Rajasthan, Madhya Pradesh, Andhra Pradesh, Orissa, Mysore, Assam, at Rahuri and Akola in Maharashtra, West Bengal, excluding IARI which is also deemed as an Agricultural University. The recent Education Commission has recommended the establishment of at least one Agricultural University in every State, and it is likely, therefore, that Agricultural Universities will soon be working in all States, with State-wide responsibilities for teaching, research and extension in all agricultural sciences.

Opposition to the New System

A far-reaching deviation from the traditional system, for which the agricultural university concept stands, was not expected to be welcomed by those long accustomed to a different set-up. Some of the administrators, legislators and public men advanced the facile argument that a system need not necessarily

* First Annual Report of the University of Agricultural Sciences (1964-65), Bangalore.

succeed in India merely because it has been a success in a different society and environment. The Inter-University Board, which represents the voice of the Indian educationists, passed a resolution in its meeting held at Dharwar on February 3, 1961, questioning the wisdom of starting what it designated as single-faculty universities of the type of agricultural universities. The votaries of traditional system, oblivious of the recommendations of the Radhakrishnan Commission, and of the First and Second Joint Indo-American Teams, were clearly not in a mood to permit a new concept to invade the precincts of their traditional stronghold. This resistance to the new concept from entrenched academic circles was very patiently and cogently argued by the Committee on Agricultural Universities headed by Dr. Ralph W. Cummings with the following words* : "It is clear to the Committee that this Resolution has been the result of a lack of full and clear understanding of the proposals, their objectives and implications". Proceeding, the Committee concluded : "On a most careful consideration of the matters, together with the pronouncements of several eminent educational and expert committees, which have examined agricultural education with great care, this Committee is fully convinced that India can ill-afford to defer the application of those principles and procedures of proven value, which have proved so effective in other countries in transforming their agricultural education to be a real and dynamic force for progressive and rapid improvement in the economic, no less than in the education status of the people".

Government of India's Decision

The Government of India in a communication dated August 22, 1961, addressed to all State Governments stated that under the existing system of agricultural education in India, Education, Research and Extension were completely divorced from each other and the training imparted to the agricultural graduates was mostly theoretical. The Government of India also pointed out that the Planning Commission had also examined this question carefully and accepted the need for the setting up of a few more such universities in addition to the Agricultural University at Rudrapur (now known as Pantnagar in Uttar Pradesh), for

* Progress Report of Committee on Agricultural Universities: Manuscript (1962) Rockefeller Foundation, New Delhi.

which a proposal was received from the Government of Uttar Pradesh in September 1956. Later, the University Grants Commission stressed that immediate and effective steps should be taken to improve the quality of agricultural education. With that end in view, the Commission suggested that since agriculture and allied subjects were not receiving necessary attention in a university imparting instruction in a large variety of subjects, it was desirable to have universities where agriculture was the central and primary subject of study and research.

Further Support

A decade of opposition to agricultural universities was thus showing signs of crumbling. The report of the Education Commission (1964-1966) headed by Dr. D S. Kothari, who is also the Chairman of the University Grants Commission and, therefore, the accredited spokesman of the traditional universities, contains the following weighty judgement* : "The central point in the programme we are recommending is the establishment of at least one agricultural university in each state".

The latest high-level body of the Government of India which is also concerned with education in agricultural sciences is the Administrative Reforms Commission. Its Agricultural Study Team has given considerable thought and attention to the role of agricultural universities.** Quoting Cato's words in the second Century B.C., "If you are late in doing one thing in agriculture, you are late in all things", the Report makes a strong plea for more realistic policies and an efficient administrative machinery to enable the country to increase production by harnessing the resources and all the knowledge of science and technology. Some of the important recommendations made by the Team in so far as they lie within the scope of this book are reported below :

- (1) Agricultural Universities should be started in all the remaining States as quickly as possible, and towards this end, the Central Government should take necessary steps ;

* Report of the Education Commission (1964-66), Manager of Publication (1966), Delhi.

** Report of Study Team on Agricultural Administration, (August 1967), Administrative Reforms Commission, New Delhi.

- (2) All aspects of research on agriculture should be the concern of the Agricultural Universities;
- (3) The constitution of a National Council of Education in Agricultural Sciences with the responsibility to regulate, foster and maintain high standards in agricultural universities is recommended; and
- (4) The subject-matter specialists at the State and District levels should be under the administrative control of the Agricultural Universities.

Establishment of Agricultural Universities and the Need for a Review

From 1949, when the University Education Commission first extolled the land grant system as an epoch-making contribution to agriculture and agricultural education and recommended that agricultural education be recognised as a major national issue and that new agricultural colleges, where possible, be associated with new rural universities, to 1960, when the first Agricultural University was established, there lies a decade of intense and searching enquiries from dozens of Committees, Teams and Commissions. Despite controversy and opposition, there was no looking back since 1949. The establishment of the Uttar Pradesh Agricultural University in 1960 gave a practical shape to the thinking of the best brains of India and from that year to 1966, no less than ten Agricultural Universities began to function, excluding the Indian Agricultural Research Institute and Kalyani University which also have some of the land grant concepts integrated into their set-up.

By the end of 1967 when eight agricultural universities functioned for a period of more than three years, it appeared to the senior author that the time was both opportune and appropriate to record the origin, development and problems of these institutions, as such a stock taking has its own well recognised purpose for the future. The publication of the book "History of Agricultural Universities" in 1968 more than justified its objective and was so well received in India and abroad that the volume disappeared from the publishers in less than a few weeks after release. Since 1967 more massive and energetic steps taken for large expansion of the original eight universities and the onset of three new universities in other States, apart from the more frequent and pressing heavy indents for the book from several

sources, necessitated a revised and enlarged edition of the work.

It is not generally known or it is a fact often over-looked that India is not only the largest democracy in the world in terms of population, but it is also one of the largest countries in Asia. If we exclude the area of the Philippines and Indo-China from the total area of South-East Asia, it would be equal to India. But the total population of South East Asia is only half that of India. Next to China in size and population, but as the largest democratic country in Asia and the world, its experience in all fields of human endeavour are bound to be of value and interest not only to all other countries in the region but also to all the developing countries in all parts of the globe

2. *Indian Agriculture Under British Rule*

IN his book "Famines in India", B.M. Bhatia says that "India has suffered from famines since time immemorial.* According to him, the available evidence suggests that in the pre-British periods a major famine occurred once in every 50 years, and "From the beginning of the eleventh century to the end of the seventeenth, there were fourteen famines almost all of which were confined to small local areas". From 1765, when the British East India Company took over the Diwani of Bengal, to 1858, "the country experienced twelve famines and four severe scarcities." "Between 1860 and 1908, famine of scarcity prevailed in one part of the country or the other, in twenty out of the total of forty-nine years".

Agriculture was based on empirical methods in all parts of the world till about the middle of the nineteenth century. The application of chemistry to soils in 1840 and the establishment of the Rothamsted Research Station in 1843, followed by the opening of the first agricultural college in England at Cirencester in 1845 are termed as the landmarks of development of agricultural science and education in the Report of the Royal Commission on Agriculture in India.**

Early Attempts to Organise Agricultural Improvement

The first proposal for a special Department of Agriculture in India originated from the Commission appointed after the Great Famine in Bengal and Orissa in 1866. The Cotton trade which exercised considerable influence at the time of moulding the policy of the Government of India, suggested in 1869 the revival of the above proposal and urged at the same time that steps be taken for the improvement of cotton and a separate Department of Agriculture be established in each Province.

* B.M. Bhatia, *Famines in India* (1963); Asia Publishing House, Bombay.

** Ibid P. 3.

The first evidence of action on this was visible only in 1871 when the Department of Revenue, Agriculture and Commerce of the Government of India began to function. This was followed by the formation of a Department of Agriculture in what is now known as Uttar Pradesh. The report of the Famine Commission of 1880 again revived the interest. Incidentally, this Commission stressed on the development of irrigation, the necessity for extension of the railway system and the means of communication, and measures for increased thrift and resourcefulness, along with the revival of the Department of Agriculture under the Government of India and the simultaneous formation of similar departments in the Provinces.

For nearly ten years, no definite action appears to have been taken. In 1889, the Secretary of State for India in London sent out Dr. J. A. Voeleker, Consulting Chemist to the Royal Agricultural Society, to advise on the matter. From the end of 1889 to the beginning of 1891 Dr. Voeleker was in India and his recommendations led to the appointment of an agricultural chemist in 1892 which post after five years was replaced by one of Inspector-General of Agriculture.* An Imperial Mycologist was appointed in 1901 and an Imperial Entomologist in 1903.

The Famine Commission of 1901 recommended strengthening the expert staff of all agricultural departments in all Provinces, and these were quickly implemented by Lord Curzon's Government and the Imperial and provincial departments of agriculture.

Agricultural Situation at the Beginning of the Century

Mr. J. W. Mollison, Inspector-General of Agriculture in India, compiled the material for the chapter on Agriculture for the Imperial Gazetteer of India published in 1907**. Considered as the most authoritative publication of the times, this book gives a graphic account of the agricultural situation in the country in the beginning of the twentieth century along with the cultural practices in vogue, principal crops, livestock position, dairying, research, agricultural education and administration. Citing Dr. Voeleker's report on the improvement of Indian Agriculture, it is recorded that the Indian cultivator at

* Voeleker : *Report on Improvement of Indian Agriculture* (1893)

** Imperial Gazetteer of India (1907), Clarendon Press, Oxford.

his best was quite as good in those days as, and in some respects the superior of, the average British farmer, while at his worst it is alleged that this state is brought about largely by an absence of facilities for improvement which is probably unequalled in any other country, and that the ryot will struggle on patiently and uncomplainingly in the face of difficulties in a way that no one else would.

Referring to crop yields and food position at that period, it is interesting to note that in good soil an average transplanted crop of rice yields about 2,400 lb., of paddy per acre in a favourable season, while during the ten years ending with 1899-1900, the exports averaged 31.5 million cwt. valued at Rs. 19 crores.* But the bulk of this exported rice came from Burma, which was then a Province of India. The exports of wheat, on the other hand, fluctuated with good and bad seasons, averaging during 1899-1900, 12.5 million cwt. but declining in 1900-1901 after a serious famine to only 5 lakh cwt. and rising in 1903-1904 to 26 million cwt. valued at Rs. 11 crores. In 1903, out of about 60 million cwt. of wheat imported into the U.K., 17 million cwt. were from India, the only countries which sent larger amounts being the U.S. (24 million cwt.) and Russia (a little over 17 million cwt.). Exports in *Sorghum* (Jowar) and *Pennisetum* (bajra) amounted to 2 million cwt. in 1903-1904 valued at 71 million rupees, while the pulse exports amounted to 2.5 million cwt. in the same year, valued at 9.15 million rupees and exports of oilseeds were 24.5 million cwt. valued at Rs. 14.5 crores, of cotton 8 million cwt. valued at Rs. 24 crores, mainly to Japan and Germany.

The Imperial Gazetteer records that the problem of improving the breed of cattle in India is very difficult. The practice of keeping alive maimed, old and worthless cattle until they die naturally, even if they give no return, except manure, for the food they consume, and the scarcity of fodder from natural grazing or cultivation, which keeps the cows and young stock semi-starved in the hot weather, is a widespread practice or phenomenon.

The Gazetteer also mentions that research and experiments in India were still in their infancy.

Although from 1905 onwards, under the stimulus and direc-

* A crore is ten million and a million is ten lakhs.

tion furnished by the Government of India and with the assistance of grants from Imperial revenues, all Provinces undertook the development of agricultural departments, progress was not everywhere equally rapid, says the Royal Commission.* The outbreak of the war (I World War) led to a suspension of activity. When hostilities ceased, a new spurt of activity developed from 1920, activated partly by the constitutional changes which followed the passing of the Government of India Act of 1919, following the Montagu-Chelmsford Report of 1918. This Act transferred the administration of all departments which were closely connected with rural welfare to the Governor acting with a Minister.

Recommendations of the Royal Commission on Agriculture

At the time these changes were taking place, the Royal Commission observed the lack of sufficiently close touch not only between Pusa** and the Provincial departments but also between the Provincial departments themselves, and that it was unfortunate that Pusa was not, from the outset, an educational as well as a research institute. Having regard to these and other matters, the Commission recommended *inter-alia* the establishment of an Imperial Council of Agricultural Research.

A direct outcome of the work of the Royal Commission on Agriculture was the establishment of the Imperial Council of Agricultural Research in 1929. Almost immediately afterwards, there was the Great Depression, during which agricultural income in India was reduced by about half, with the result that the farmers' plight became steadily worse. The recovery began by the end of the thirties, but with the onset of World War II, the Government's attention was largely devoted to mobilisation of men and money towards war effort.

However, it is clear upto the end of the British period, agricultural scarcities and famines were largely man-made. Although, with the separation of Burma the rice position was very adversely affected and exports of rice ceased, the food position remained a problem of primarily the administrators and less of the producers.

*Ibid p. 3.

**Pusa in the province of Bihar was the location for the Indian Agricultural Research Institute till it was shifted to New Delhi after the earthquake in 1936.

3. *Post-Independence Period*

INDIA won independence on August 15, 1947. The importance attached by the new nation to education is reflected in the Government of India resolution of November 4, 1948, setting up the Indian University Education Commission. The Commission was asked to report on University Education and suggest improvements and extensions desirable to suit present and future requirements of the country. Dr. S. Radhakrishnan, then Spalding Professor of Eastern Religions and Ethics at the University of Oxford who latter became the President of India (1962-67) was the Chairman. Members included Dr. (later Sir) James F. Duff, Dr. Arthur E. Morgan, Dr. John J. Tigert and six eminent Indian educationists, Dr. Zakir Husain, Dr. Tara Chand, Dr. A. Lakshmanaswami Mudaliar, Dr. Meghnad Saha, Dr. Karm Narayan Bahl and Mr. Nirmal Kumar Sidhanta. The Commission's report in three volumes was published in August 1949. Monumental as this report was, its recommendations helped greatly to shape the destinies of higher education in India.

The Commission recorded deep general awareness of the importance of higher education for national welfare, uneasy sense of inadequacy of the prevailing pattern, serious shortcomings in the functioning of the Universities, marked deterioration of standards in teaching and examinations and increasing dissatisfaction with the conduct of university administration and elections of university authorities.

Number of Universities in 1949

By the time the Commission began to work, India had over 20 universities of which three (Calcutta, Bombay and Madras) were founded in 1857, one (Allahabad) in 1887, two (Banaras and Mysore) in 1916, one (Patna) in 1917, one (Osmania) in 1918, two (Aligarh and Lucknow) in 1926, two (Agra and Andhra) in 1927, one (Annamalai) in 1929, one (Travancore) in

1937, one (Utkal) in 1943, one (Saugor) in 1946, three (Rajputana, East Punjab and Gauhati) in 1947, three (Poona, Roorkee and Kashmir) in 1948 and one (Baroda) in 1949.

Commission's Views and Recommendations

Referring to agriculture, the Commission remarked that the country's position in regard to food production was pathetic. India, with more than 70 per cent of the people engaged in agriculture yet imported food grains; 1.5 million tons in 1946, 2.0 million tons in 1947, 3.0 million tons in 1948 and nearly 4.5 million tons in 1949 at a total cost of 200 crores of rupees.

The Commission bemoaned the lack of a reasonable amount of research of quality. Citing the Scientific Manpower Committee, it states that the number of Ph.D. and D.Sc. degrees in six basic sciences, awarded by the universities of India during 1938-1948 totalled to only 260, an average of 26 per year. On top of this, there were signs of a steady decline in the quality and quantity of research. Since science is indispensable to civilised existence and a main factor in determining the direction of progress, the Commission urged that the country needed a constant flow not only of trained scientific workers but also of scientific leaders imbued with the spirit of research.

The developments during the half century preceding the work of this Commission led to the establishment of 21 institutions for higher education in agriculture. The number of enrolments to 17 agricultural colleges rose steadily from 30 in 1924 to 1448 in 1948. The number of M.Sc.s and doctorates turned out from these colleges during 1946-47 was 74, while 156 candidates received post-graduate diplomas in agriculture, veterinary, forestry, dairying, and allied sciences in the same year. Facilities for training in post-graduate research work in agricultural sciences was available in India in 1948 for only 166 students. The Commission compared this situation in India with that in the US, where there was no agricultural education prior to 1862. After July 1862, when the Morrill Act was passed, as many as 70 land grant universities and colleges were established until 1949, enrolling approximately a million students, besides reaching a large section of the adult population through extension educational services. As an indication of how fast the economic structure in the US was being developed, the

Commission has pointed out that "the total agricultural income of Florida was \$97,980,000 in 1935, \$115,009,000 in 1940 and \$413,071,000 in 1946".

Rural Universities

For Rural Universities the Commission devoted one whole chapter. The Commission specifically recommended that "a rural university should include a ring of small, resident, undergraduate colleges, with specialised and university facilities at the centre". A common core of liberal education was recommended for the rural university as for other universities, though the methods used in teaching and learning may be different. This common core should include substantial introduction to the fields of mathematics, chemistry, physics, geology, astronomy, biology, physical education, psychology, the social sciences, philosophy and language and literature. As to advanced and specialised subjects, the Commission recommended that no field of human concern should be foreign to the rural university. The curriculum should be made to fit the needs of individuals, and not the students made to conform to an arbitrary curriculum.

Community Development and National Extension Service

In 1952, a Grow More Food Enquiry Committee came to the conclusion that the lesson to be derived was that all aspects of rural life were inter-related and that no lasting results could be achieved if aspects of it were dealt with in isolation. These views and recommendations led the Government of India to set up a National Extension Service and a new unit development administration known as the Community Development Block. The size of the block and its resources varied from time to time, though the central purpose of the block concept remained. This is to bring the development administration as near to the village as the country's resources can afford to equip it with a team for coordinated and integrated field extension work in all the inter-related sectors of agriculture, animal husbandry, rural industries, co-operatives, health and sanitation, rural communications, social, educational and allied activities.

By 1963, a decade after the inception of the programme, the whole country was covered by Community Development Blocks

and the National Extension agency which went with them. A measure of experimentation and improvisation was inherent in the process.

A Committee which went into the working of these Community Development Blocks after they were in existence for five years, found that the programme had remained largely under official leadership and had not evoked popular enthusiasm to the desired extent. It concluded that it was very necessary that there should be devolution of power and decentralisation of machinery and that such power should be exercised and such machinery controlled and directed by popular representatives of the local area.

A working group again reviewed the progress of this programme in 1963. Among the important recommendations of the group was, the merger at the Secretariat level of the States departments concerned with agriculture and other sectors of rural development.

The contours of policy on Community Development have continued to be under discussion since then. A nation-wide programme of this nature involving no less than about 60,000 Village-Level Workers with a hierarchy of other staff has necessarily to justify itself by results and accomplishments. A press statement made on December 27, 1967 by the Union Minister of State for Community Development indicates that the achievements made so far have not been unimpressive and it would be suicidal to give up the programme.

Rural Institutes

While no action was taken to implement the recommendation of the Royal Commission on Agriculture to set up Rural Universities, the Government of India in the Ministry of Education set up a Committee in 1955, which recommended the establishment of a series of so-called "Rural Institutes". Little attention was paid to the pattern proposed by the Commission for the formation of Rural Universities. The term "Rural Institutes" for an analogous institution with a different series of objectives was adopted. The rural institutes have had a chequered career, neither becoming popular with the public, nor developing a capacity to render effective service, so that they never counted as centres of higher education in agricultural sciences.

First Joint Indo-American Team

Meanwhile the Ministry of Food and Agriculture was having its own ideas on the needs of the situation. The importance of breaking new ground on the lines indicated by the Commission was recognised. At this time Dr. Frank W. Parker came on the scene as TCM Advisor to the Ministry at New Delhi and his advice and efforts culminated in the setting up of a Joint Indo-American Team.

In a resolution of November 24, 1954, the Indian Ministry of Food and Agriculture made special reference to the experience of the institutions in the USA, particularly the land grant colleges and hoped that these colleges would provide some useful guidelines for strengthening agricultural colleges in India and for promoting Centre-State cooperation and coordination in the field of agricultural research. Accordingly, that resolution contained the decision of the Government of India to constitute a joint team of Indian and American specialists to make a comparative study of the institutions in the USA and India and make recommendations. This team had Mr. K.R. Damle, the then Vice-President of Indian Council of Agricultural Research as the Chairman, with three Indian specialists and three specialists from the USA, besides the Secretary, who was also the Secretary of the Indian Council of Agricultural Research. The three American specialists were Dr. A. H. Moseman, Dean R.E. Buchanan and Dr. E.E. Leasure, while the Indian counterparts were Dr. B.N. Uppal, Dr. L. Sahai, and Dr. H.K. Nandi with Mr. J.V.A. Nehemia as Secretary.

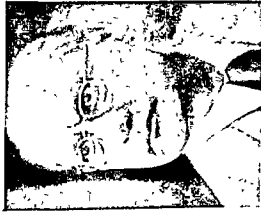
The Indian representatives on the team visited the US for about three months in 1955 to study research and educational institutions and their activities, while the American members of the team reviewed the research and educational progress in India. The report submitted by the team in September 1955, contained 118 recommendations, which together laid the true foundation for all the subsequent developments in India leading to the establishment of Agricultural Universities and enhancing the value of research work in agricultural sciences in India.*

Endorsing the recommendation of the University Education Commission that a Rural University should include a ring

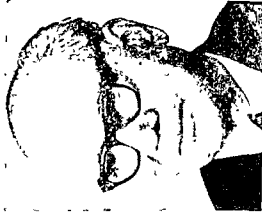
* Report of the Joint Indo-American Team on Agricultural Research and Education (1955)—ICAR, New Delhi.



Mr. K. R. Damle



Dr. M. S. Randhawa



Dr. B. P. Pal

Architects of agricultural universities — Indian counterpart to the American effort

were Dr. B.N. Uppal, Dr. L. Sahai, Mr. Lal Singh, Mr. P.D. Nair, Dr. M.D. Patel, Dr. J.S. Patel, Mr. Ibne Ali and Dr. K C. Naik (Secretary).

This team reviewed the progress of the work done in the preceding five years and made supplementary recommendations designed to strengthen agricultural education, research and extension. The summary of the Team's recommendations submitted on July 11, 1960, included 67 items.* On agricultural university, the team recorded that there was widespread demand from many States for the establishment of agricultural universities. But in some cases demands were being made without even understanding all the goals and objectives of the agricultural universities and without any awareness of the needs of such university. The team, therefore, recommended that assistance to establish an agricultural university should not be granted unless there is adherence to basic principles such as (i) autonomous status, (ii) location of Agricultural, Veterinary/Animal Husbandry, Home Science, Technological and Science Colleges on the same campus, (iii) integration of teaching by offering courses in any of these institutions to provide a composite course, and (iv) integration of education, research and extension.

Referring to research, the team recommended among others that all the Central Research Institutes be brought under the full technical and administrative control of the Indian Council of Agricultural Research and that all the Commodity Committees, including the Central Sugarcane Committee, be brought also under the full control of the Indian Council of Agricultural Research.

The team further recommended that USAID technical assistance under the Inter-University Contract Programme should largely be concentrated in fewer colleges with special emphasis on those institutions which are likely to develop into agricultural universities.

Most of the foregoing recommendations as further amplified by subsequent reviewing Committees have been accepted and implemented.

Meanwhile, encouraged by USAID Advisors and the Rockefeller Foundation, some of the State representatives were deput-

* Report of the Second Joint Indo-American Team on Agricultural Education, Research and Extension, (1960) I.C.A.R., New Delhi.

gest changes in the organisation and administration of research, greater co-ordination between Centre and the States, (ii) prepare detailed proposals for improving effectiveness of research so as to meet the real needs for substantial and sustained improvement in agricultural production and progress, and (iii) suggest steps to ensure an adequate contact with the agricultural extension worker to bring about a two-way traffic between the farmer and the research institution.

The Chairman of this Agricultural Research Review Team was Dr. Marion Wesley Parker of USDA. The other members were: Dr. Roy Lee Lovvorn, Dr. Oscar Burr Ross, Dr. E.E. Cheesman, Dr. L. Sahai, Dr. K. Ramaiah and Prof. P. Maheshwari. Dr. S.K. Mukherjee, Deputy Agricultural Commissioner (Education), Indian Council of Agricultural Research was appointed the Liaison Officer.

This team's report was submitted on March 19, 1964-66.* Its twenty recommendations cover the conditions under which research is prosecuted, the organisation for coordinating effort and the organisation for ensuring full utilisation of the results of research. It made a bold suggestion to abolish I.C.A.R. and replace it by a new Council for Agricultural and Food Research in order to develop and administer a national programme commensurate with the country's needs. The new Council is to assume full technical and administrative control of all Central Research Institutes, all Commodity Committees and certain other research organisations financed by the Government of India through various channels. The team affirmed that an agricultural university provides a better environment for research than a State Department of Agriculture and that the Universities should, therefore, be given full support in every State. The Team also noted that some means of encouraging cooperation between Centre and States in the sphere of agricultural research are imperative. Well-equipped research centres to accommodate teams of research specialists were suggested as essential for work which falls between that of the Central Institutes and of the local experiment stations, or which needs joint participation of both. The team considered that agricul-

* Report of the Agricultural Research Review Team, New Delhi, March 19, 1964-Manuscript.

tural universities provide the most favourable locations for such terms.

Many of the recommendations of this team have been accepted and implemented. The reorganisation of the Indian Council of Agricultural Research is largely the outcome of above recommendations. Commodity Committees have now been abolished. Most Central Agricultural research institutions have now been put under the Council. Recruitment rules have been changed. The Council itself is now headed by a scientist, rather than an administrator. In fact, the Council is about all set now to assume its proper role. One would hope it does. Much will depend upon the purposefulness, devotion and tenacity with which it pursues its objectives.

According to Dr. Ensminger, none of the agricultural inputs is more important in the long run than new knowledge resulting from research. India is to be commended for having taken bold, imaginative and urgently needed steps in administratively restructuring Central Government sponsored agricultural research, streamlining the determination of research priorities and giving leadership to the development of a national network of agricultural universities and research institutions. The intensive agricultural programme* is now drawing on this redrawn and revitalised research to assure that its package of practices represents the best available technology.**

Cummings Committee

By the beginning of 1961, as a sequel to the recommendations of the First and Second Joint Indo-American Teams, actively stimulated by the sustained efforts of many American advisors, interest in establishing agricultural universities grew

* The reference here is to the Intensive Agriculture District Programme more popularly known as the Package Districts. There is one package district in each State. Besides, there is also the Intensive Agricultural Area Programme (IAA) at selected areas all over the country. These two activities together are called the intensive agricultural programmes. The basic idea here is the 'package approach' and a concentration of efforts.

** Dr. Douglas Ensminger-Strategy for Action in Agricultural Development. Address at the Central Conference of Key Personnel connected with Intensive Agricultural Programmes, New Delhi, December 6, 1962.

to become a movement, particularly in those States where well-informed opinion on the potentialities of the land-grant system was available at the institutional and administrative levels. The Government of India, therefore, felt the need to appoint a committee to examine the proposals received from the State Governments to establish Agricultural Universities from the point of view of prerequisites for the integration of teaching, research and extension and the evolution of a workable relationship between the existing institutions and departments. This Committee was headed by Dr. Ralph W. Cummings, Field Director, the Rockefeller Foundation, who was to play for many years a dominant role in shaping the course development of many agricultural universities in India, continuing the valuable role played earlier by Dr. Frank W. Parker in guiding the thinking of the administrators both at the Central and State Governments' levels. Dr. Cummings had Ephriam Hixon of USAID, Dr. L. Sahai, Animal Husbandry Commissioner, and Dr. K.C. Naik (Convenor) as the members of his Committee to start with. This Committee has since become widely known in the country as the Cummings Committee.

At the instance of the Government of India and at times on the specific requests of State Governments, the Cummings Committee visited several States and helped them draw up their proposals and also scrutinise the draft bills prepared by them in this connection. Earlier, a blueprint of an agricultural university had been prepared by Dean H.W. Hannah and circulated to all the State Governments in 1956. It was largely on the basis of this blueprint that some of the State Governments were tempted to develop their proposals, with such modifications as they considered necessary to suit their respective peculiarities. It was specifically on the basis of this blue-print the U.P. Government submitted a proposal to the Government of India in September, 1956, to establish an agricultural university near Rudrapur in Terai, U.P.

Establishment of the First Agricultural Universities

After discussing with the Planning Commission the Government of India decided, however, that during the Second Five-Year Plan only one Agricultural University be established (U.P.) as an experimental measure but, in view of the wide-spread



Dr. R. W. Cummings



Dr. D. Ensminger



Dr. O. N. Liming



Dr. R. O. Olson

Some of the American architects of agricultural universities in India



Dr. F. W. Parker



Dr. E. Hixon



Dr. S. T. Sutton



Dr. G. C. Holm

Some of the American architects of agricultural universities in India

demand from many States for such universities, the Government of India accepted in 1961 the need for setting up a few more such universities during the Third Plan period. Both the Planning Commission and the Government of India, however, felt that preference should be given at that stage for establishing Agricultural Universities at the existing colleges or institutions which possess strong and effective departments for teaching and research and have already shown a rural bias in the course of their development. The Government of India also indicated to the State Governments that it was not likely that the special assistance available from the Government of India to the States for the purpose would exceed at the outset Rs 25 lakhs in any individual case. On this basis and with certain broad directions, the Government of India requested all State Governments in August 1961 to intimate as soon as possible and in any case not later than September 30, 1961, their programme of setting up an Agricultural University during the Third Plan, whether consultations have been held with the Cummings Committee and if so with what result, how they propose to adjust their Plan and the extent of central assistance required, whether any draft bill has been prepared after consultation with the Committee and if so to what extent the conditions are satisfied, and whether in the light of the views of the Planning Commission their proposals for the entrustment of extension and research work to these institutions would require modifications and if so to what extent and in what respect.

The Cummings Committee notes that the traditional Universities have handled the training of agricultural graduates and the departments of agriculture and Community Development have the programmes of research and extension activities. While they have maintained some liaison with one another, the relationship has not been close enough to ensure maximum transfer of information and practices from one to the other. There are 53 agricultural colleges, and 17 veterinary colleges in the country. Many of these are under the control and management of the State Governments while others are managed by private agencies. Divorced as they are from experiment stations and extension organisations, the agricultural training programmes under the universities have elicited a substantial amount of criticism. Unless and until the programmes are overhauled and

reorganised, it would not be possible to meet the needs of the actual cultivator and to attain the country's goals for considerable increase in agricultural production

The Cummings Committee visited several of the States upon invitation, conferred with State Government officials with respect to draft legislation, and offered suggestions as to the pattern of development of institutions and services for agriculture within the States in relation to the agricultural university development.

The offshoot of the work of this Committee is reflected in the establishment of six Agricultural Universities during the Third Plan period at Ludhiana, Udaipur, Jabalpur, Hyderabad, Bangalore and Bhubaneswar, excluding the one at Kalyani accepted by the Government of India as equivalent to an Agricultural University and the Indian Agricultural Research Institute, New Delhi, which has a big post graduate training programme more or less on the land-grant pattern.

The University of Kalyani is located in West Bengal and was established in 1960 under the Kalyani University Act, 1960, to provide for instruction and training in the humanities and sciences generally, and agriculture, veterinary and allied sciences in particular. In some respects Kalyani introduced a different set-up from that of the pattern followed in other Agricultural Universities.

Education Commission

By 1966, while the seven infant institutions were finding their feet and fresh developments of establishing new Agricultural Universities in other States were taking shape, the Government of India set up another important body known as the Education Commission. This was appointed in a resolution dated 14th July 1964, and the report of the Commission was submitted in June 1966. Dr. D. S. Kothari, Chairman, University Grants Commission headed this Education Commission. The foreign members included Mr. H. L. Elvin from the U. K., Prof. Sadatoshi Ihara from Japan, Prof. Roger Revelle from the U. S., Prof. S. A. Shumovsky from the U.S.S.R., Mon. Jean Thomas from UNESCO and J.F. McDougall from UNESCO as Associate Secretary. The Indian members were Mr. A. R. Dawood, Mr. R. A. Gopalaswami, Dr. V. S. Jha, Mr. P. N.

Kirpal, Prof M V. Mathur, Dr. B P. Pal, Miss. S. Panandikar, Dr. K G. Sanyidain, Dr. T. Sen, and Mr. J.P. Naik as Member-Secretary.

This Commission covered the entire field of education in India and devoted one chapter of 20 pages to "Education for Agriculture". Affirming that recent events have demonstrated the backward state of agricultural development in India, the Commission was definite that the goals can only be achieved through the application of science and technology to the problems of agricultural production and rural betterment.

Specifically, the Commission supported the establishment of at least one agricultural university in each State. The Commission desired that these universities should have the following features :

- (1) Their concern with all aspects of increasing, disseminating, and supplying knowledge related to agriculture, including basic and applied research ;
- (2) Their primary emphasis on teaching and research directly and immediately related to the solution of the social and economic problems of the country side ;
- (3) Their readiness to develop and teach the wide range of applied sciences and technologies needed to build up the rural economy ;
- (4) Their readiness, not only to teach undergraduates, post-graduates and research students, but also to give specialised technical training to young people who are not candidates for degrees; and
- (5) Their emphasis on adult and continuing education side by side with teaching regularly enrolled students.

The salient features of all the recommendations made by several expert bodies of educationists, scientists and the best thinking minds are, therefore, in favour of developing agricultural universities as instruments for progress of agriculture in India. The Fourth Plan will be the crucial period when these widely accepted concepts will be implemented.

Increase in Agricultural Production in Post-Independence Period

While several Commissions and Committees were engaged in the task of modernising the educational, research and extension patterns, pressure increased on food supplies, necessitating

the Central and State Governments to look for fresh methods and means to increase food production.

India has only 2.4 per cent of the world's land area but as much as 14 per cent of the population. Her population is currently around 520 millions and is increasing at a rate of 2.4 per cent a year. Prior to 1950, the average agricultural growth rate was 0.5 per cent, but during the first 15 years of planning it increased to 3.9 per cent. From 54.9 million tons of foodgrains in 1950-51 the production rose to 89.0 million tons in 1964-65 and reached 100 million tons in 1970. Because of extensive drought, production fell to 72.3 million tons in 1965-66, but picked up the following year to touch 75.9 million tons. On per acre basis, the yield of foodgrains was 1,219 lbs. in 1949-50 but it rose to 1,669 lbs. in 1964-65 — a 37 per cent increase. By bringing down the birth rate from the present 41 per 1000 to 25 per 1000 by the end of 1976, so that it does not cut into per capita availability of food grains, which is roughly 16.7 oz. per day (to be raised to 18.5 oz. by 1970-71), and by increasing food production to 120 million tons per year, the country expects to move toward food self-sufficiency in 1970-71, according to India's planners

Lessons from the Performance of Agriculture

The national plans formulated with high priority for agriculture provided for increase in production primarily by adding inputs to the agricultural sector, rather than by improving input-output ratio within agriculture through improved farming methods. A rather low priority towards measures designed to make more efficient use of existing resources through the infusion of science and technology resulted in an insignificant increase in efficiency of agriculture, while the bulk of increase in food production was obtained from additional capital inputs such as through major and minor irrigation, land reclamation, flood control, fertilisers, soil conservation, drainage, etc. Many economists have expressed the view that the foregoing facts have had profound implications on the long-range prospects for Indian economic development. In the final analysis, it is recognised that lasting results can only accrue with education processes, but such processes require not only to be intensified

and organisationally improved, but they have also to be closely intertwined with research, if it is to confer benefits.

Foundation for Rapid and Sustained Progress

The major findings of a study on the performance of agriculture in 26 developing nations, including India, from 1948 to 1963 have several lessons of interest and value.* This study affirms that rapid rates of increase in crop output have not happened just as a consequence of normal economic and social processes in societies organised on a laissez-faire basis. Rather, they have been under girded by aggressive group action, generally national in scope, directed specifically to improving production conditions. Referring to food supplies, the study has brought out that, if present food supplies of India were distributed as far as they would go at the rate of 2,300 calories per person per day, 48 million out of that country's 480 million people would be left totally without food. If the same food supplies were distributed at the US consumption rate of 3,190 calories per person per day, 153 million of India's people would be without food.

Available data indicate that agricultural technologies of underdeveloped countries are still highly rudimentary, and that countries that have made the most of rapid technological progress are generally those that have achieved the most rapid increases in crop yields.

The report emphasises the role of science and technology in strengthening a country's foundation for rapid and sustained progress. Given these, there will yet be the basic need for development of human skills as an essential component of economic progress. High priority to increasing knowledge through research and to increasing the level of education and skills of people becomes, therefore, the prerequisite of sustained growth.

One measure of effort being made by Governments to improve research and education is per capita expenditure on them. This is admittedly low in most developing countries. Research and extension programmes are also most effective when they are

* Changes in Agriculture in 26 Developing Nations: 1948 to 1963. Foreign Agricultural Economic Report No. 27: Economic Research Service, U.S. Department of Agriculture, Washington, D.C. (November, 1965).

closely linked with education and are further supported by a large fund without which a constantly increasing stock of improved technologies is impossible.

Agricultural teaching institutions of the post-independence era, having been designed for formal education, were following a curriculum which placed a premium on bookish knowledge and routine learning rather than on developing ability and competence to solve the immense problems of Indian agriculture. The curriculum was out of step with modern knowledge, as it was subject to change only infrequently and was isolated from research. It was also out of tune with the life of the people as the institutions had no role to play in the extension education of the farming communities. The development of useful skills and the inculcation of the right kind of interests, attitudes and values could not be given sufficient emphasis in these institutions which were developed in the essentially static past of the colonial era.

With no reformation of the basic concepts in the physical, biological and social sciences with the rapid advance of science, the inadequacies of the existing methods and procedures in higher education in agricultural sciences were brought into sharper focus. Consequently, the gulf between the college of the university and Indian agriculture became increasingly wider. A revolution in higher education does not mean a mere change in curriculum, a little tinkering with procedures and pay scale, but a continuing, planned reformation towards specific goals. The aim of the many recommendations by commissions and committees was, therefore, to enable India to travel in a few years on the road over which the United States had to labour for over one hundred years.

Qualitative improvement in university education has been considered difficult in an affiliating type of university. What is good for all colleges can also be good for anyone of the affiliated colleges, and reforms or improvements can only be possible when the poorest college finds it possible to implement them, says Parikh.* Even when improvements are made, they are hardly uniform or satisfactory in a good many institutions. In effect, the University tends to become a largely administrative

* G D. Parikh-Higher Education and Economic Development Quest, Special Number (March, 1967).

body, concerned merely with laying down courses, examining students and conferring degrees.

A trend of the post-independence era in particular is the establishment of scientific laboratories outside the universities. About 30 national laboratories have been established since 1947 in different parts of the country under the Council of Scientific and Industrial Research (CSIR), ostensibly for dealing with practical problems of industry. These include the Botanical Survey of India, the Zoological Survey of India, the National Botanical Gardens at Lucknow, the Central Food and Technological Research Institute at Mysore, and the Central Indian Medical Plants Organisation, all of which, being isolated and independent of the Indian Council of Agricultural Research and the Universities tend to function as units carrying on sometimes the same kind of research as the universities, I.C.A.R. coordinated research centres or other State research centres do. Some of these C.S.I.R. national laboratories have also demanded recognition by universities and have prepared students for research degrees. This development of scientific research outside the universities tends to impoverish the research talents and facilities in the latter.

The national laboratories under the C.S.I.R. and the I.C.A.R. are more or less under the control of the Central Government, and the autonomy enjoyed by the two bodies is subject largely to the rules and regulations laid down by the Government. When educational and research institutions do not enjoy full autonomy, they have necessarily to function under the considerable power of scrutiny and surveillance vested with the Government, with the result that there is almost a pathological insistence on a single line of authority and an exaggerated emphasis on the administration wing of the institution. This casts its shadow over the academic and research functions, the bunches of rules and regulations leading to red tape, and unimaginative rules of audit and accounting severely restricting the operational freedom of the teachers and scientists. There has been some, perhaps significant, migration of experienced teachers and professors from universities to these national laboratories which initially satisfied them by way of higher and attractive pay scales and quite modern settings in brick and mortar. Depleted of their experienced teachers the universities heavily

suffered in their primary function of training young men to play the role of scientists. Indirectly this is accepted to be one of the reasons for students' unrest at many of the university campuses. These observations were recently emphasised by a scientist of no less eminence than Sir. C.V. Raman in his address to the students of the I.I.T. Kanpur.

Many institutions today suffer acutely from the tyranny of the steel framed secretariat type, which is the enemy of creativity. Under these conditions even the most reputed and talented scientists tend to resolve or reconcile to toe the line of least resistance for mere survival, becoming anaemic, subservient file carriers under the guise of scientific administration, and deprived of their initiative, power and authority. Even under these conditions, it is strange that many scientists have preferred to be in administration. The few workers are those that are engaged in research to appropriate it for a higher degree from a university. One can expect neither dynamism nor motivation to be conspicuous at such institutions.

The culmination of all the deliberations, dialogues and discussions in the field of agricultural education, research and extension in the past two decades is the urge for a change in which the agricultural universities aspire to be more than a mere self-sustaining academic community. Rather, their aim is to assume leadership in effecting improvement in agriculture and to train for the higher cadres of leadership in the line. Operating democratically, decisions are not to be left in these new institutions to the intuition of one decision maker, but are to be based on expertise of a high order. It is only then could these universities move beyond the pulls between expansion and quality or the maintenance of *status quo* and progress or a comfortable mediocrity and dedicated leadership.

4. *Breakthrough After Early Struggle*

REASON and enlightenment on one hand, and sheer necessity on the other, liberate people from many traditional beliefs and practices. Indeed from what has been stated earlier, it will be clear that a process of liberation in the field of agricultural education had long been underway in India, although the first tangible signs of it became clear with the release of the Radhakrishnan Commission's monumental report. In the years that followed, many educationists and thinkers were busy in prescribing what ought to be done to improve the education system. Although a growing number of leaders of thought recognised that the education system the country inherited from the British days was not suitable, the ideas were too elastic for anyone to speak either with certainty or authority on what might be a better system. The Rural University concept of the Radhakrishnan Commission did not hit the headlines when education and political leaders on one side, and several Muslim leaders on the other, had befriended the ideas and systems as reflected by the Banaras Hindu University and Aligarh Muslim University. These are the Central Universities and are not subject to the control or discipline of State Governments.

Rural Institutes Instead of Rural Universities

The early period of post-independence era was also one in which the newly elected members of the legislature were conscious of and sensitive to the new importance of the people and of themselves as representatives of the nation. Eager to make their views and presence felt, some of them at least observed or cared little for constraints in suggesting modifications or undertaking innovations. The Rural Institute concept won fairly wide acceptance among many politicians, and fairly munificent financial aids. While these Rural Institutes received all possible backing and support, the term "Rural Institutes"

was used for an analogous institution with a somewhat different series of objectives. Rural Institutes are neither Rural Universities nor Vocational "Manjri" type schools.

Hence, the Second Joint Indo-American Team's forthright recommendation that these Rural Institutes, as presently organised, were serving no useful purpose in the agricultural education programme. Three of the Rural Institutes are being proposed to be elevated to the rank of Universities contrary to the original concept and objectives. The policies and procedures followed by the Central Ministries of Education and Agriculture appear clearly to be at variance in this regard. To an extent even the U.S. advisors appear to have worked at cross purposes, for there have been advisors associated with Rural Institutes as well as with Agricultural Universities.

Opposition from the Traditionalists

The Agricultural Universities would have certainly gained greater strength, if attention and funds of the Central Ministry of Education were not diverted to Rural Institutes. The Agricultural University concept faced snipping from other educationists of the old or traditional school also, and although this has abated considerably over the years, it has not disappeared altogether even to this day. Even after the Planning Commission, the Food and Agricultural Ministry, the University Grants Commission and Dr. Kothari's Education Commission accepted the Agricultural University concept and the Kothari Commission recommended the establishment of one Agricultural University in each State of India, three Vice-chancellors of Mysore State resolved in a meeting held at Dharwar in 1966 that the traditional Universities should continue to enjoy the privilege of affiliating agricultural colleges to their universities, thus deploring the transfer of such colleges to the control of agricultural universities. Either to dilute the concept of agricultural universities or to side track the issue or both, some educationists and Vice-Chancellors proposed the establishment of single faculty universities for engineering and medicine. All such attempts were aborted at their very inception.

Among the critics of Agricultural Universities, many have been those who had no opportunity to understand its aims and philosophy. It was experienced by the senior author during the

meetings of one of the Task Forces of the Education Commission and during his discussion with the members of that Commission, that a vast majority of the members of that Commission had serious misgivings about the utility and effectiveness of the agricultural university concept for Indian agriculture. It speaks a great deal of their objectivity that after a series of discussions the Commission unanimously recommended this concept to be adopted by the country as a whole.

Mr. C. Subramaniam, Union Minister for Food and Agriculture, stated in his address at the First Convocation of the University of Agricultural Sciences at Bangalore on December 19, 1966, that "Because of the many advantages of this educational innovation, eminent agricultural scientists like Sir Joseph Hutchinson of the Cambridge University in the United Kingdom, have remarked that the most significant development in the field of Indian agriculture during the past one century is the initiation of Agricultural Universities". Sir Joseph belongs to the country which gave the traditional university system to India and his views ought to carry a great deal of weight with the tradition-bound educationists in India.

Provincial or State Loyalties

Another kind of struggle the new universities had to face was provincial or State loyalties and rivalries as illustrated by the following two developments. One AID committee recommended after an objective survey and study that an institute of Instrumentation should be located at a specific centre along with one Agricultural University, but this was opposed by representatives of a few Agricultural Universities, with the result that a decision had ultimately to be taken, splitting up the Institute into several bits perhaps to make the project acceptable to as many Agricultural Universities as possible. Another proposal made by one high-level FAO/UNESCO team to set up Advanced or Post-Graduate Centres at certain locations along with the existing Agricultural Universities came also for criticism by Vice-Chancellors of a few other Universities whose locations did not find favour with the team.

It should not be forgotten that all the agricultural universities have a common and noble objective development of agricultural wealth of the country as a whole. The choice of

location of any project should be to exploit the available natural resources at the chosen centre but not to build super structures or monuments at a centre devoid of all natural advantages. Any attempt at unhealthy competition is ruinous. It is appropriate to underline the fact that in USA "the land grant colleges and State universities have never through their Association or otherwise fostered competition among themselves. By concentrating on their common problems and *clinging* together they eventually became a tremendous force in the field of higher education".

Financial Resources

Among the many forms of assistance that the Indian Council of Agricultural Research has rendered to these universities was that in securing financial aid from the Government of India to the States for establishing agricultural universities. Much was expected of this form of assistance and, in fact, one of the chief motivating factors for establishing agricultural universities among the State Governments was the hope of securing substantial funds from the Centre. The first Agricultural University established in Pantnagar did receive substantial grants as Central assistance and, at one time, about Rs. 40 crores were expected to become available as Central assistance to the agricultural universities during the Fourth Plan. This soon dwindled into about Rs. 20 crores. The central assistance during 1966-67, which was the first year of the Fourth Plan, has rarely exceeded Rs. 10 lakhs to a University, and this was hardly sufficient to put up even one library building. Thus far, the Central assistance has been insignificant to younger universities, while the State assistance has been uncertain and was equally discouraging to a majority of the universities.

State Governments' Uncertain Attitudes

If the Centre's financial assistance was not appreciable, it had, however, extended *uniform and consistent moral support* and guidance, which were not always forthcoming from the State Governments. Much of the attitude on the part of the States became soon evident, and the State Government officials quickly began to operate as "We" and "They", and "ours" and "theirs", implying that the transferred institutions could no

longer enjoy the same rights and privileges as they enjoyed prior to the transfer. Much of what followed had its genesis in such a psychological change.

Attitude of State Departments

It has also been the experience that some of the Departmental Heads take up, what may be construed as not a very positively helpful attitude to develop a cooperative relationship. There are instances of persons who worked for the transfer of research to the universities while they were the employees of the university, but suddenly reversed their stand when they were repatriated to State departments.

Not only a close working rapport has not been established but a spirit of veiled hostility has begun to grow between the university and certain State departments. Where there were individuals who had been frustrated in their desire to get higher salaried posts in the university, this spirit perhaps got greatly accentuated. A gradual shifting of talents from the departments to the universities where fresh opportunities were opening up contributed possibly further to the spirit of rivalry and jealousy, so that the first few years of the transfer of certain functions from the State departments to the university were by no means a period of smooth change.

Legal Difficulties

Legal difficulties created further challenges to these new universities. Some of the employees were transferred to the young universities just when their turns for promotion in the State departments became ripe. Naturally, they did not wish to lose an opportunity to gain a higher post with increased emoluments and jump into a position where nothing was assured and where the results of the competition for a higher position could not be predicted. Another class of people were those who were holding temporary posts and to whom option to stay where they were, was not allowed in some States. Still others were those who desired to stick on to a place where they had certain advantages of climate or certain benefits by virtue of possessing properties or nearness to relatives and similar advantages, and who tried every means at their disposal for the *statu quo*.

Anticipating many of these problems and situations, the University of Agricultural Sciences, Bangalore entered into negotiations with the State Government of Mysore well ahead of the expected date of transfer of institutions, suggesting guidelines for the transfer of employees of the Government to the University. What is more gratifying was the same rules and regulations governing pay, pension, leave and retirement age etc., were made applicable to one and all of their employees who were transferred from the State department. As this obviously solved many of the day-to-day administrative troubles, it would be worth copying by other universities as well.

In one State an opportunity to exercise option to remain in the State department or otherwise was not only denied but all Government rules of disadvantage such as for example retirement at the age of 55 were imposed on them, while the so called direct recruits to the University were given all benefits including the retirement age at 60. Still worse was the long and irksome indecision to equalise the pay scales of research and teaching staff. When the minds of all are in a state of agitation due to threatened insecurity, total absence of a new school of thought, or non-initiation of a new productive line of research, or no attempt to adopt new teaching method, occasions no surprise. As one has put it, the two marked events in some departments are the unfailing sun rise and sun set.

Difficulties of Individual Institutions

The Uttar Pradesh Agricultural University faced problems, some of which were distinctive.

An unhappy trend to which this university had to commit itself because of the policies and decisions of State Government, was the large-scale commercialisation of its seed-producing and other connected farm-borne industries. The State Government's decision that the University can have no annual grants to support the operation of the University other than what the University can obtain from the Tarai State Farm left no choice to the University but to do everything possible to increase the income from the farm. Leaving about 1300 acres for the experiment station, the University plunged into the major task of producing seeds of hybrid maize and Mexican wheat, and sugar-

cane to feed the factory, and such other ventures that stepped up the income from a mere ten lakhs of rupees to as high as Rs. 40 lakhs, with the ultimate target of Rs. one crore or over per annum. This is indeed a good achievement as a farm management venture but many may consider this to be outside the legitimate functions of a university.

Another handicap from the standpoint of this university is its limited jurisdiction.

The special handicap suffered by the OUAT, Orissa and J.N.K.V.V. Jabalpur (M.P) by being dependent on funds routed through State Departments of Agriculture and by having had to manage their institutions with employees of the State Government, have already been mentioned earlier.

Indian Administrative System

The Expert Committee on Assessment and Evaluation of the Intensive Agricultural District Programme (IADP) in its draft report dated April 20, 1966, has remarked as follows :

"On the other hand, experience has also shown that the rather archaic administrative system that obtains in the country has proved to be a most serious obstacle to the IADP. This administrative system, based essentially on checks and balances evolved in a different time and for a different purpose is more procedure-oriented than action-minded and has proved woefully inadequate for any operation, the aim of which is not to maintain the *status quo* but to change it".

If we agree that administration is vital to achieve success in nation-building activities and that the existing system could not be expected to measure up to the requirements, we cannot be bogged down by officialdom's innate distaste for change or innovation.

Any change in administration designed to promote agricultural prosperity, must inevitably affect millions of farmers. The organisational complex, administrative arrangements and talents that are associated with successful industrial management are not all similar to what will benefit this vast segment of humanity comprising of millions of independent farmers operating under no standardised code of conduct or discipline. Added to this, we have the almost infinite variety of local conditions, compounded by the interaction of those varying factors, which

makes uniformity of procedures many a time impracticable.

It has been stated that the Great Bengal Famine of 1943, which claimed a toll of 35 lakh (3.5 million) lives, was as much a product of drought as of administrative defects during the war. Administration's role both in times of stress and strain as well as in nation-building activities is obviously vital.

Opposition from Administrators

The initial struggles which the new Agricultural Universities had to face were indeed un-paralleled in scope or magnitude. The entrenched opposition from the traditional universities was nothing compared to the built-in opposition from some of the administrators. It will be an over-simplification to describe these as teething troubles. Very often they appeared to be matters of life and death, so much so, during the difficult formative period, some Vice-Chancellors at least experienced a feeling of floundering in the slough of despondency and even thought of running away from the post. If they still remained at their posts, it was because of the occasional rides they had on the crest of waves, which though a few and far between, helped to maintain spirits and open up vistas of great possibilities.

To enumerate the numerous hurdles that different Vice-Chancellors had to counter will make this book a sorry tale of unending woes. These unhappy experiences, however, soon brought home to the Vice-Chancellors the recognition that even the best system of education, research and extension that man can devise, could be a flop if pitted against an administration which is rigid, wooden and inimical to change.

The Tasks for the Youth of To-day

The commitment to go ahead of the new set-up of agricultural universities has now proceeded beyond the point of no return. Many of the ideas that bear no relevance to the current times and new aspirations of the people were jettisoned. The atmosphere is poised with sufficient optimism for the success of the new venture. The fruitful and rewarding results of work of some of the universities have appeared right on the fields of the farmers, although the process of transformation to the new set-up in any university still remains incomplete and imperfect. Many of the obstacles in the process discussed earlier

are growth problems common to all developing countries which are in great haste to match the developed nations of the globe. Their occurrence at the outset is an advantage, for, what ultimately but slowly crystalises would be a finished product of utility requiring no correction or amendment later. With the functioning of a few more universities the coverage would be complete and pockets of mediocrity will disappear. Even, if men have willingly accepted the challenge of the new set-up, the serious limitation in a developing country is the lack of technical men. There is no substitute to training them in the country that needs them. This is the primary function of an agricultural university. We have at command the experiences of a country similar to ours in the set-up of the Government adopted means which are acceptable to us and attained rich goals that we cherish. The youth of today is therefore to be trained for the tasks of tomorrow ; and we have to keep in view what President Roosevelt of-USA observed "You cannot always build the future for your youth but we can build our youth for the future".

5. *Centre-State Relations and Relations Between the Universities and State Departments*

THE Constitution of India provides for certain functions to be handled by the Union Government exclusively, others to be handled by the States exclusively, and certain other functions to be handled either by the Union Government or by the States. According to the seventh schedule of the constitution, the following is the division of responsibilities for research :

List I—Union List

- No. 65. Union agencies and institutions for—(b) the promotion of special studies of research.
- No. 66. Co ordination and determination of standards in institutions for higher education or research and scientific and technical institutions.

List II—State List

- No. 14. Agriculture, including agricultural education and research, protection against pests and prevention of plant diseases.
- No. 15. Preservation, protection and improvement of stock and prevention of animal diseases ; veterinary training and practice.

It may appear from the above that both the Centre and the States must assume a share of the responsibility for ensuring progress through agricultural education, extension and research.

A little closer scrutiny of the provisions will, however, show that :

- (1) the Union Governmental agencies and institutions are

- only responsible for the *promotion* of research, which is not the same thing as the *conduct* of research; and
- (2) for *co ordination* and determination of standards in State institutions and not for *undertaking* themselves responsibilities for higher education or research.

If the foregoing view is accepted, it follows that the States have the responsibility for the conduct of special studies or research promoted or sponsored by the Union Government, but *they are required to subject themselves to such inspection that the Union Government may consider necessary for the purpose of co-ordination and determination of standards in teaching institutions.*

In the State list, agricultural education and research, *including* veterinary training and practice are specifically mentioned as State responsibilities.

Institutions Inherited from Pre-Independence Period

Before the country became independent and the Indian Constitution was formed, many Central Institutes for research and education in agricultural sciences had already been founded—as shown in chapter 2.

In 1955, the responsibility for the training of extension personnel was transferred from the Indian Council of Agricultural Research to a separate Extension and Training Directorate in the Ministry of Food and Agriculture, thus divorcing *extension and extension training from research and education at the Central level.*

Meanwhile, several Commodity Committees were also established for oilseed, cotton, sugarcane, tobacco, jute, coconut, lac and arecanuts, and all of which were under the control of the Central Ministry of Food and Agriculture, as it was the hope that special attention was necessary to deal with the problems of these crops. Not only all these developments constituted in effect an inroad into the responsibilities devolving upon the States under the constitution, but they also had a detrimental effect on the State's capacity to further research on these commodities on their own, and further led to the neglect of the many important problems that transcend commodity fields.

It has not been possible to effect radical changes in the

inherited institutions to strictly conform to the provisions of Indian Constitution. Thus, many educational institutions still remain in tact under the control of the Centre and so are many research institutions. In fact, in some respects the continued erosion of States' responsibilities is occurring even after the acceptance of recommendations made by the ICAR Research Review Team. For instance, forest colleges and dairy educational institutions continue to function under the Centre's control in the States, while sub-stations for research with some major research Stations are operating in many States with funds from and under the control of the Central Government.

High-level Committee's Recommendations

The principal recommendations on research made by the several expert bodies during the past two decades as reviewed by the High-Level Committee of the Food and Agricultural Ministry in 1962 may be summarised as follows :

1. Shortfalls both in coverage and intensity of research are considerable.
2. It is necessary to classify the existing research stations to reduce their number, wherever necessary, to avoid duplication or to improve quality, and to develop and strengthen them on a regional basis, wherever possible.
3. There is urgent need to define precisely the role of the Central and State institutions and of the Indian Council of Agricultural Research in the sphere of agricultural research.
4. Central institutions should be 'quality' institutions concerning themselves with national problems and fundamental research including methodology and testing of innovations published abroad.
5. They should not establish branch stations, but should avail of the facilities existing at Regional/State stations in the execution of their programmes.
6. The Indian Council of Agricultural Research should function as a truly coordinating and evaluating agency, initiating new research work, strengthening research work in Central, Regional or State spheres.

State's Responsibilities

Coming to the State's responsibilities, there is little doubt that despite their inadequacy of resources, some of the States have shown remarkable capacity to have many colleges of agriculture and research, or experiment stations numbering as many as 60 to 80 in each of some of the States, with facilities and resources hardly adequate to support one well-equipped research centre with or without one Agricultural College.

Working under three to five departments, sometimes with as many Secretaries and more than one Minister, the State research and educational centres have scope for dissimilar or even conflicting policies, though almost all have identical problems of low salary scales, poor library and laboratory facilities in most of the isolated research centres, and generally ill-trained scientists working with little guidance and very often burdened with a load of non-scientific duties. There are instances of Agricultural Colleges, where one Professor had to teach four different subjects; more than five changes of a lecturer in one academic year; of three Research Stations being in charge of one person; of research centres whose annual reports have not been written for three to four years at a stretch. The position in private colleges can only be far worse.

On the other hand, over 50,000 Village Level Workers with numerous Block Development Officers and Agricultural Extension Officers are said to be busy, according to one writer, in keeping their jeeps constantly humming and tea kettles boiling while the farmers are reported to treat them with amused indifference. In our Agricultural Colleges, the agricultural graduates trained at least in some of the institutions are of very varying quality, a type of generalists, inadequately prepared to direct critical thought to solving problems which confront them.

Coordinated Efforts

As against this wide dispersal of uncoordinated efforts in education, research and extension, the recent examples of coordinated effort for evolving hybrids of maize, *Sorghum* and *Pennisetum*, (bajra), provide a marked contrast. Within a very few years, hybrids with very high yield potentials and responsive to high levels of fertilization have been evolved under coordi-

nated research projects operated with funds and support of several agencies—the Indian Council of Agricultural Research, the Rockefeller Foundation, the Indian Agricultural Research Institute, State Governments, Agricultural Universities and the Agricultural Research Service, USDA. The yield increase under these high-yielding crops have virtually brought a revolution in the Indian farmer's thinking and practices, unprecedented in the country's history.

The disparity in accomplishment between coordinated research projects and the pitiful, repetitive and unco-ordinated efforts at a multiplicity of State and Central locations, is further accentuated by the disparity in the salary scales between the Central and State research workers as well as in the educational efforts between the States and Centre. The disparity in salary scales, quantity and quality of research and education efforts as between the Government effort at the State level and that supported from private funds is even more striking.

Reviews of Research Projects

In contrast with the paper reviews of Commodity Committee sponsored research, the PL480 supported (ARS-ICAR Co-operative) research in India has a provision for on-the-spot negotiations for every research project to assess the real capacity and competence of every location for handling the research project, followed by annual technical and fiscal reviews. Sometimes special technical review of each project is also being done by one of the most eminent scientists in each special field by bringing him over from the US for this purpose. Such effective reviews in respect of *ad hoc* research projects in combination with coordinated research sponsored by ICAR are expected to make Indian research in agricultural sciences both productive and economic.

Educational Standards

In so far as educational standards are concerned, there was also an equally wide gulf between institutions not only under different agencies, but sometimes even within a State and even when operating under the same administrative control. As an instance the enrolment standards and requirements for the College of Agriculture in Dharwar and the College of Agricul-

ture in Hebbal, both of which were under the control of the State Agricultural Department, Mysore, were different till both these colleges came under the control of the University of Agricultural Sciences, Bangalore.

After Agricultural Universities were established and the enrolment standards as also the standards of teaching and examinations were enhanced and standardised, the disparity between these universities has become much wider. To prevent or correct this, proposals for accreditation of colleges were mooted and considered many times, but no final decision has yet been taken on this important question of promoting a uniform standard all over the country.

Full Autonomy Essential For I.C.A.R.

After the Indian Council of Agricultural Research was reorganised broadly on the recommendations of I.C.A.R. Research Review Team, support for research is being channelled to Agricultural universities through cent-per-cent grants for coordinated research projects. Although this has meant a significant step forward, the red-tape observed in financial screening of the projects militates against the smooth and expeditious implementation of the projects. These limitations are inevitable as long as the Indian Council of Agricultural Research is not allowed complete autonomy to manage its resources in the way it thinks best, instead of allowing a finance man to dictate or regulate the Council's activities.

The current practice of the Indian Council of Agricultural Research functioning through its Governing Body, Advisory Body, Standing Committees and Scientific Panels, all constituted with a majority of scientists and teachers and representatives of progressive farmers, is a healthy one. The debates in all these meetings are well informed, constructive and helpful except in the annual meetings of the Council when one could have plenty of oratory from politicians over subjects sometimes unconnected with the Indian Council of Agricultural Research's role and activities. So far as agricultural universities are concerned, the Indian Council of Agricultural Research has been its watch dog, though in terms of actual contribution the Indian Council of Agricultural Research has not been very effective,

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possibly because the bureaucratic set up at the Centre is less amenable to technical opinion.

Need for Expertise

While all these proposals and developments have the support of the Indian Council of Agricultural Research, the absence of a body at the Centre like the Cummings Committee to advise the States with expert opinion and scrutinise its draft bills and proposals is keenly felt. Development of such high import cannot be left safely to the decision of a few overworked officials of the Indian Council of Agricultural Research. The existence of an expert body like the Cummings Committee was by itself an assurance to the States who were keen to seek its views directly whenever they had doubts to be cleared or felt the need for their guidance or assistance.

It seems necessary and even inevitable for the Association of Agricultural universities to take up functions of the "Cummings Committee" and play a very vigorous and decisive role in the formative years. In cooperation with the official organisation at the ICAR, the Association might put the universities on sound basis and continue to watch them till every institution attains maturity.

Mutual Responsibility

While on the question of Centre-State relationship, and relation between the universities and the State agencies or Governments, it is necessary to emphasize the fact that the division of Centre-State functions was largely an adaptation of the British sponsored reforms following World War II. Whether the States are all competent to do the job and discharge their responsibilities fully if all the functions of education, research and extension in agricultural sciences are transferred by the Union Government to them, is a question on which there will be sharp differences of opinion. Agricultural Universities exist at present only in ten States, and not all of them are keen or equipped to take over responsibilities of extension education. In all matters pertaining to agriculture and its development, we have to recognise the joint and complementary responsibilities and functions of the Union and State Governments. Likewise, the joint and complementary responsibilities of the State Depart-

ments of Agriculture, Veterinary, Animal Husbandry, Horticulture, Fisheries, Forestry etc., on one hand, and the Agricultural Universities on the other, have to be recognised. Much has been done toward this end in Punjab and effectively too. The extension education programme in the Punjab and the pilot extension project on high-yielding varieties with OXFAM and GOI fertilizer in Mysore and later with US-AID assistance are examples of such collaborative effort.

To have effective universities, one must want to have them. Establishing a university far removed from the traditional pattern involves a major change of outlook among the representatives of the public who have the right to vote in legislature, among the State and Central Government key officers who have to process the University's request for funds and facilities of all kinds, among the Pro-Chancellors and Chancellors who are at the apex of University organisation and, last but not the least, the State departments from whom the institutions were transferred to the control of agricultural universities and between whom and the universities the functions have been divided for rendering more useful, effective and timely service to agriculture and farming communities.

Evidence of the gradually improving system in India is evidenced by (a) establishment of agricultural universities, (b) elimination of Commodity Committee-sponsored research, (c) re-organisation of ICAR under technical leadership, (d) development of All-India research projects on a coordinated basis, (e) increased integration of research, teaching and extension in several States and (f) continued Centre support for the above in the report of the Education Commission. Indian agricultural research, education and extension are being rapidly modified and improved along the lines suggested by expert committees and commissions. To be sure, there are problems. Some of the changes are slow but the progress is there and the problems are bound to be resolved soon.

Some even in responsible quarters, feel the current trend as distressing and even calamitous. The fact is they do not belong to this age and their contentions are sterile and self-defeating. The time is opportune, though highly disturbed, for an optimist to meet the challenge and set the country on the path

of science and technology for development. It is therefore well said "An optimist sees an opportunity in every calamity, a pessimist sees a calamity in every opportunity".

6. *New Patterns in Agricultural Education and Research*

EDUCATION in a sense is co-terminous with life. The development of language enabled man to draw upon the experience of other regions and other periods so that man developed an instrument of advance which enabled him to achieve mastery over other animals and increasing control over the forces of nature. Education thus became an instrument of advance and progress, but a strange division of it into conceptual education and practical training prevailed and largely accepted. Thus, only intellectual activities were given the dignity of education while others like agriculture and industry which sustained life and human society were described as skills and were relegated to a lower place. Only in the modern era when some western countries applied esoteric knowledge to production of better food and consumer goods, industry and agriculture gained some prestige. Soon the yardstick of measurement of the prosperity and well-being of a country was accepted to be the industrial and technological growth in which agriculture had a vital place.

Esteem and Regard for Education

A high level of education attainment, heavy expenditures of private and public funds for education, and the strong beliefs that education must form a vital part of any programme for giving equal opportunity to all the citizens—all these assert the high regard in which citizens of advanced nations hold education. In the USA, education has been the principal pathway of the upward pattern of social mobility which has characterised its history. As the general level of educational attainment of the citizens rises, the aspirations of parents for the education of their children follow.

In the less developed countries also, education holds a high place in the aspirations of government leaders and citizens. The general level of education attainment is low and the leaders look

to education as a pathway to social, economic and political development. The parents look to education as a means to upward social mobility for their children.

Low Prestige of Agricultural Education

In many of the developing nations, the agricultural colleges have enjoyed a lower status than colleges of medicine, science, and arts. In several cases it appeared that financial support for other professional programmes was given priority over agricultural programmes. Often, a majority of the students who graduated from an agricultural college did so only because they had been turned down by other colleges of the university. Agriculture was not their first choice. Where this condition prevailed, and it was commonly found throughout the world, it was difficult for members of the technical assistance programme to develop good relationships with staff who were not proud of their positions or with students who would have preferred to be in another field.

On the status and pay scales of agricultural scientists in India Dr. Stewart* stated in 1947 :

"There is in my opinion a very great need for improving the status and salary of members of the staffs of agricultural departments in India. On tour I did not consider that I was over-paying my personal bearer, but I found nevertheless that I was paying him more than many an agricultural graduate was receiving as a salaried member of an agricultural staff. In the absence of improvement in both salaries and status I fail to see how it will be possible in the future either to attract recruits to, or indeed hold in the service men of the mental calibre needed to solve the many problems of agriculture".

Studies by the staff of the Institute of International Education show that agriculture is not studied by a very high proportion of the students who come to U.S.A. For example in Columbia 60% of the people earn their living from farming, 38% of the gross national product is produced by agriculture but only 5% of the students in the university are known to be studying agriculture.**

* Stewart, A. H., *Report on Soil Fertility in India*, p. 41, Submitted to I.C.A.R., New Delhi, 1947.

** Open doors 1963 Institute of International Education—New York 1963.

More recently Dr. Mellor* made a candid observation of considerable relevance and significance: "One might ask successful and prosperous individuals in South Asia if their first choice for career for their most able children is to do research in agriculture; the answer will generally be "NO". The problem is not simply to change the attitudes but to change the basis for those attitudes".

A recent study in India disclosed that the per cent of first class men at both undergraduate and post-graduate courses in agricultural and veterinary sciences during the years 1964-67 were extremely poor supporting the fact that the best brains of the country have, rarely taken up to agriculture. The output of first class men is too small to meet even a fraction of the needs of agricultural research activities.

PER CENT OF FIRST CLASSES OBTAINED**

Year	Agriculture		Veterinary	
	B. Sc. Ag.	M. Sc. Ag.	B.V. Sc.	M.V. Sc.
1964-65	16.2	24.3	2.1	46.0
1965-66	17.2	24.2	2.7	25.1
1966-67	20.2	27.9	7.2	28.1

The employment potential, the scales of pay in comparison to other technical or administrative services and even social prestige attached to agriculture has been solely responsible for this. This has been underlined as an important aspect of study by the III Pay Commission appointed by Government of India for Central Government employees in a press editorial† which reads as: "The most glaring anomaly in the present pay structure relates to the differences in the scales of the administrative services and those holding technical jobs. With the growing importance of technical personnel in a planned and developing economy it is necessary to remove the disparities derived from a colonial past and render justice to the highly qualified men who

* J.W. Mellor—Science & Technology in Agricultural Development. *Science Reporter* 4, p. 37, (1967).

** Personal communication from Dr. O.P. Gautam.

† "Formidable Task" (Editorial), *Indian Express*, April 27, 1970.

are playing a vital role in building up the country's industries, railways and other technical services". What applies to these sectors of economy, will apply with only greater force to agriculture.

Weak Aspects of Traditional Education

Almost all the developing countries have now come to realise the relative importance of technical education as a means of advancement on modern lines ; this amounts to technical training in agriculture and industries. For nearly a century some attempts were made in India to establish educational institutions devoted to training in agriculture, veterinary and forestry. All these early attempts were weak in three respects according to Sir Eric Ashby :

(1) They failed to set and maintain the quality of teaching and standards of achievement essential for Indian degree to be acceptable in other countries ;

(2) They failed to devise, and persuade Indians to accept a content of higher education suited to India's social and economic needs ; and

(3) They failed to establish patterns of academic government and relations between universities and the state that would accord to universities that degree of autonomy without which they cannot serve society properly.

The University Education Commission suggested in 1949 : "A full-fledged college of agriculture should, in our opinion, be able to make provision not only for instruction and practical training, but also for research and extension work. It should endeavour to establish itself as the leader in progressive agricultural practice of the surrounding countryside. It should apply itself to the problems of the immediate neighbourhood and attempt, by its own extension work, to carry the results of its investigations to the peasantry around. This alone can make the instructional and research sides of its activity more realistic and fruitful than they generally tend to be".

Land Grant College Model in India

Though India has accepted the land grant model from the US, the aim was not to transplant that system in the Indian soil, but adapt it to Indian conditions and setting. This is none

too easy as the interaction between long tradition and the imposed revolutionary change, made many doubt seriously the utility of the reform. Yet, the change has come about much quicker than most imagined and these new "service-oriented" institutions directly related to field problems of the farmers are now dotted over the Indian scene.

The very concept of a new university for Agricultural Sciences in a developing country raised the prestige and status of this long neglected group of rural science faculties, which so long remained as appendages to conventional universities. Secondly, a real breakthrough was evident when related functions and subjects to agriculture were grouped together under one roof, creating in the minds of scientists a feeling that their work would be of practical utility and of national concern. Above all, several opportunities have now been created for young men and women for their intellectual elevation, social and economical upward mobility.

The suitability of these new institutions can further be examined on the basis of certain criteria.

The new institution must in the first place be capable of performing specified services to agriculture. Such services must be designed and discharged at a minimum cost, implying that the designing of the institution should be appropriate to the region. Secondly, the institution should not aim to be highly sophisticated, as that serves no purpose and would result in such a high cost that the country cannot afford. Lastly, the institutional output must be geared to the social and economic needs of the society.

Judged from the above criteria, the agricultural universities in India may be deemed to have demonstrated the philosophy of service to the farmer in several ways. At the same time, it is clear that much remains to be done and that too with greater velocity and greater dedication and determination.

Need-based Pattern

In adapting the pattern of the land grant college the Agricultural universities in India have taken the following measures to distinguish them from the traditional universities :*

* 1962 A case study—Agricultural Universities Development in India 1956 Through 1962. Project 386—AA. 11. AE. USAID, Washington D.C.

(1) The Agricultural University recognizes a responsibility and responsiveness to the needs of cultivators in contrast with being only a seat of learning and scholarship, and assumes a responsibility for working towards the economic development and improvement of the standard of living of the people of the State.

(2) In addition to resident teaching for degree candidates, the staff also have responsibility for applied as well as fundamental research in agriculture. Such research must go beyond the laboratory and into the fields and home, and with the live-stock, under varying conditions found in different parts of the State.

(3) The chief medium through which the cultivators are to derive the benefits of the training programmes and of the research work under agricultural university is the extension limb of the university, which should be fully integrated with teaching and research organisations, so that a smooth and effective flow of the results of research and of the training programmes to the cultivators be possible and the problems of the cultivators may similarly be transmitted back to the teaching and training centres for being tackled promptly and effectively.

(4) The territory of the university with respect to the agricultural and related sciences should include the entire State, in keeping with the above principles and responsibilities.

(5) The curricula and the training programmes should be modelled in a manner as to be in keeping with the needs of the State on the one hand, and of the aptitudes and needs of the individual students or trainees on the other. This must involve the formulation of a flexible curriculum with suitable provisions for courses of instruction in a wide field and the appointment of teachers who have specialised in their respective disciplines.

Curriculum and Teaching Methods

The abandonment of the old curriculum with its external examinations and its replacement by a more complex curriculum with internal evaluation is perhaps the most important single consequence of the reform as reflected in the introduction of agricultural university concept. This is of special significance in the context of immense pressure for superficial education; something to give reputation and polish at the least expense of

time and effort. One becomes "an educated man" by virtue of getting a parchment in a convocation: this was the oft-repeated allegation, but which cannot apply to the reformed institutions under the current agricultural university set-up.

When the trimester system was introduced in these universities, the teachers who brought many prejudices and performance derived from their previous training and from their personnel idiosyncrasies found it difficult in the beginning to adjust themselves to the new system of teaching and examination. Some had been teachers for long under the old system; some had been trained under the Indian and English Universities where semester or trimester systems were not followed. The free and frank discussions during the orientation helped to remove misunderstandings. Fortunately, many teachers had a model to be followed, a model in which nearly half the teachers in at least some universities had already experience in the US institutions through the participant programme.

Each course in a semester or trimester is self-contained and complete. Final marks are given for each course upon the termination of study and examination in that course. The earning of a degree by a student is determined by the cumulative marks in the individual courses.

Students may elect to establish a major in any one of the divisions of the university other than the division of Basic Sciences. It is the purpose of the curriculum to provide that all students have a fundamental understanding of the State's agriculture and the underlying basic sciences.

The curricular changes introduced by the agricultural universities since their inception together with an appreciable improvement in the attitudes of the teachers, in course content and teaching methods have greatly upgraded the standard of teaching agricultural sciences. There is great awareness among these universities to encourage coverage of many different fields in an integrated or cohesive manner. The provision for a good deal of flexibility of curriculum permits deep penetration into a selected field of knowledge and leads to some degree of specialisation at the under-graduate level. A certain degree of diversity in individual training has thus been introduced enabling students to acquire a degree of special competence in the fields of their greatest interest and capability. In a field which

presents technical and practical problems such as in agriculture, training all students exactly the same way as in traditional type colleges will not help the country to deal with all problems resourcefully.

Examinations

The external examination which has merited strong condemnation by the University Education Commission as one of the worst features of Indian educational system has been completely eliminated by most of the agricultural universities, while some have been able to do this in part. Udaipur University having both the affiliated and constituent colleges, has introduced internal evaluation only in its constituent colleges, of agricultural sciences. In some universities with a large number of campuses, the maintenance of uniformity in evaluation standards presents a problem of some magnitude, but each of these universities has been endeavouring to devise solutions to it. Until a system of self-accreditation is adopted by each institution to maintain high standards, this problem is likely to continue.

The content of examinations has also been modified in several universities in order to better measure the specific kinds of student competence and to serve as effective aids in the teaching process.

Internal examinations make for more effective overall student-teacher relationships, permit adaptation of courses to local situations and problems, to new knowledge and to particular competencies and interests of students and instructors—thus making courses much more challenging both for students and instructors and developing enquiring attitude towards the subject-matter.

Advantages for intermittent examinations, and other devices, for measuring student performance over the erst-while terminal or annual examinations are: (a) they encourage constant study throughout the year and thus develop in students good work habits; (b) they greatly improve overall classroom performance by keeping students abreast of subject matter; (c) they permit the instructor to appraise his teaching and to make necessary corrections; and (d) they permit use of examination aids. Intermittent examinations are

supplemented by a final examination which covers the course as a whole and contributes about one third of the students' total marks.

Some Concepts of Research

Research and Science have become household words even in developing countries. Many are anxious to know what these are, their significance and impact on the welfare of human society. Even prior to an understanding of these, the ill effects of scientific research ("atom bomb", "radiation hazards") have come to be widely known to many of us, so that the attitude towards science and research has been less respectful. *To gain the lost ground many of the nations have pronounced that even their atomic and nuclear research is only aimed for peaceful purposes.*

Many a time research is regarded as a rich nation's occupation, and questions are often hurled at the researcher as to its utility to the common man. Even in U.K., when Faraday demonstrated long ago to Prime Minister Gladstone the phenomenon of electric current, the inquisitive Prime Minister asked what was the use of that? Pat came the answer from the prophetic researcher "You can tax it Sir". While research in fundamental sciences has proceeded with vigour and speed, and the results arising out of it have profoundly impressed the public, technological research in agriculture and industry had a relatively late start. The delay was more than made up in developed countries by accelerating and catalysing research efforts with financial support, from the Government and Public agencies, and by enhancing the prestige of the scientific workers.

Finances for Research

Governments in developing countries have constantly been examining how much money would be required for development of science and technology or how much should be invested on research. Examination of published figures for some countries does not reveal any clear or simple relationship between research and economic growth. Some advanced countries are known to spend about 1 to 3½ per cent of the gross national product on research and development. But no formula can be blindly applied to a developing country like

India. Investment has necessarily to be based on the needs and the available technical and trained human resources. Available investments must also be apportioned strictly according to priorities of the different projects under agricultural development.

Currently, scientific research is increasingly expensive—sometimes alarmingly so—and it is therefore necessary that within pure science choices may have to be made which have certain areas virtually untouched. In a thought-provoking lecture Lord R. A. Todd observed “it is surely far better for a country to concentrate its main effort in fields where it has both first class men and direct interest in the kind of training they will provide than to spread its resources so thinly over every field that makes no real impact on any of them”.* He placed great emphasis on the production of adequate numbers of properly trained scientists and technologists. This amounts to the organisation of an educational system that trains men to discharge specific functions.

Bradfield recently observed : ** “I greatly fear that we are not doing as well with this select group (of scientists deputed for training to the US) as we should. The reasons are (i) faults in the training, motivation they have had at home before they came to US and (ii) wrong kind of training in the US. These are exactly the reasons why Governments in developing countries should concentrate on building host institutions to train their men in their own country. It is in institution-building that technical assistance from advanced countries should be most welcome.

Pure and Applied Research

It is extremely difficult, if not impossible, to know the dimensions of pure and applied research of a project and where they are separable. By pure science is meant “the pursuit of knowledge untrammelled by economic objectives. It provides the seed from which later—possibly much later—will come technologi-

* Lord R.A. Todd : A National Strategy for Science. *Science Reporter* 7 : (3) 1970, C.S.I.R., New Delhi.

** Richard Bradfield “The role of educated people in the agricultural development. Agricultural Sciences for the developing nations” Ed. A ff. Moseman Pub : Radha Krishna Prakashan, Delhi, 1964.

cal advances from which political and economic powers may derive". There can be a sharp line of demarcation between the two but such an attempt serves no purpose.

In agricultural research the terms basic or fundamental and applied are commonly used. Every investigation necessarily has an agricultural bias, which means that whatever is achieved in the laboratory should be easy of translation or application to field practice. For instance, the results of an investigation of placement of a fertiliser at various depths in the soil varying $\frac{1}{2}$ " to 12" has little or no relevance to field practice where phosphate can be applied in rice field either on the surface or deep in the soil. All research problems can and necessarily be solved by men with basic degree in agriculture followed by M.Sc., or Ph.D. but one need not hastily conclude that knowledge of basic sciences is optional. An insecticidal chemist should have sufficient depth of knowledge on physical and organic chemistry and the habits of insects or fungus as pests of crops. In full recognition of this the US system recognises the majoring subjects and supporting minor fields, so that in composite effect the trainee would be in a position to build adaptive research built on sound fundamentals. No argument is valid on the relative importance, for it is like ascertaining whether the container is vital to the contents or the reverse. In the context of the Indian situation however, the agricultural graduates receiving training as per US land grant system cannot be regarded as unsuitable for almost all the research positions in various faculties with certain reservations to high specialisation in fields such as instrumentation, soil physics, nuclear and radiation research.

Agricultural Research—Special Features

Research in agriculture has its own peculiarities. In short, agricultural research is essentially putting a question to Nature *in the hope of getting an answer*—the answer is the result of an interaction of three complex natural factors, the plant, the soil and the environment. The subject is so complex that straight forward answers are usually not possible. For example, constant and close vigil, and an intimate touch with the plant population are essential over long periods before a plant breeder could pick up a more promising plant of desirable attributes. It is therefore well said by Dr. Norman E. Borlaug of Mexico :

"Plants speak to men but only in whisper; their voice can be heard only by those who remain close to them". Even such whispers are absent from the soil to the agronomist. The vagaries of the environment are unpredicable. In this intricate net-work of opposing forces and cross purposes the agricultural scientist is to work out his problems.

Currently, in United States much concern is felt about certain attitudes towards research by faculty members, and also the financing agencies, the industry and the Government. Faculty members are being accused by themselves and by others of devoting too much attention to their individual scholarly interests and too little to big problems that worry the world and the nation.* Many research workers frequently feel that doing basic research leads to higher professional standing than does engaging in applied research.

In agricultural research however it is important that a large proportion of projects devoted to immediate field problems of the farmer be given high priority for a variety of reasons. Firstly, farmers are urgently in need of a solution of the problems and secondly the public and legislators can adequately influence the Government for adequate financial support of such research programmes. The common man and the influential legislators are always more impressed by the practical results of research than by the uncertain promise of big gains to be had some time in the indefinite future from long-term and perhaps more basic research. Also it is necessary to concentrate primarily on crops for which there is internal and external markets.

Time is a big and decisive factor for agricultural production, although improved science and technology has considerably helped. One must be aware of the following factors prior to an investment in agricultural research : (1) The returns from an investment in education and research in agriculture although eventually is large and significant, do not come quickly and usually need a generation or more for fruition. (2) The interaction of a large number of improved agricultural practices is essential for large gains in agricultural production. (3) Agriculture cannot advance alone but requires simultaneous development of industries which supply essential goods and services to

**Science*—Editorial (1969) 164 (3881).

agriculture. (4) Large returns from agricultural development are not realised till farmers responsible for a high proportion of the *national production* have adopted improved agronomic practices.

Inter-disciplinary Research

Crop production at a site is the net effect of interaction of a large number of factors. To attain maximum production therefore, a set of factors (practices) that are known to interact most effectively are now being adopted by farmers in all advanced countries. Such a concept is the result of acceptance of the principle of coordination of related functions which occurs at its best in a natural system. The details of this process can only be deciphered and spelt out if scientists of related disciplines coordinate their research functions. This is what is known as inter-disciplinary research. Thus, a disease problem may be met by changed plant varieties, bred for disease resistance; by biological or chemical control measures, or by changed agronomic practices. The optimal choice requires a coordination of efforts across these and other disciplines. In some cases a problem cannot be solved without the coordinated efforts of several disciplines. But for the interdisciplinary approach, it would not have been possible to unravel the facets and inter-relations of the vital process the photosynthesis. Writing on this topic Prof. Rosenberg of the University of Pittsburg said "my first education in photosynthesis was an apprenticeship with Prof. Frank, a Physicist, and Prof. Hons Gaffron a biochemist who proved by their own examples that men of widely different backgrounds and points of reference can and must work together to uncode nature's secrets". A voluminous study of the cell biochemistry during the years 1902 to 1968 was possible through scientific discoveries by no less than 40 Nobel laureates of whom at least six were physicists whose discovery of new tools alone helped all others.

For lack of appreciation of this fundamental principle, our research effort towards basic problems in the past have neither failed nor succeeded to an appreciable extent. This is essentially due to the fact that the dimensions of the problem and the involvement of the different disciplines in it have never been adequately appreciated. To put it more clearly, individual

glory dominated and collective victory missed. There are few instances where specialists of different disciplines met together and much less talked common language. This has not been peculiar to India alone. There is evidence that much of the failure of agricultural research in U.S.A. prior to 1930s lay with lack of coordination of efforts among the several disciplines concerned with solution of particular problems.*

Regional Research Centres

Agricultural production is one of facilitating biological growth under almost infinitely varying conditions. Since it is not feasible to alter significantly many important environmental factors, the kinds and varieties of crops grown and the management practices followed must be adjusted to differences in local environment, if rewarding results are to be obtained. Standardized recommendations for wide areas are seldom, if ever, justified.

Adaptive research and experimentation for the purpose of developing combinations of improved practices suited to a wide range of environmental conditions requires a net-work of experiment stations and testing facilities as well as research institutions engaged in work of a more fundamental character. This often gives rise to difficult organizational questions in the early years of a country's development. Political considerations sometimes result in the scattering of limited resources including trained manpower, among too many institutions for effective use.

The development of improved practices that will produce really significant increases in yields usually requires both modern facilities and the services of a highly trained staff, well balanced as between the relevant disciplines. Concentrating a developing country's limited research resources in one or two institutions is not likely to be easy in the face of pressures for an agricultural college and experiment station in each major political subdivision.

Of particular relevance to India relating to the type and pattern of agricultural research organisation the observations of

* Richard Bradfield (Opportunities for soil scientists in freeing the world from hunger.) Presidential address to the 7th International Congress of soil science, Madison, Wisconsin, 1960.

Prof. T.W. Schultz* would appear appropriate. He observed "There are three unresolved issues with respect to agricultural research centres in poor countries (i) the number, (ii) the competence of the scientific personnel, and (iii) the optimum

AGRICULTURAL UNIVERSITIES IN INDIA AND REGIONAL RESEARCH STATIONS AND CAMPUSES IN MYSORE STATE



A new concept of research organisation in agriculture since the establishment of agricultural universities.

(University of Agricultural Sciences, Mysore State)

* Prof. T.W. Schultz; Economic Growth from Traditional Agricultural Sciences for Developing Nations. Ed. A.H. Mesemah. Pub. Radha Krishna Prakashan, Delhi (1964).

size. It would have been absurd to opt for only one such centre in the United States and to locate it outside Washington, D.C. It is fully as absurd to conceive of Pusa at New Delhi as the agricultural research centre for all of India. As to the second issue, clearly there is no substitute for scientific competence. The AID—university contracts in general have not succeeded on this score. On the other hand, the International Rice Research Institute in the Philippines is acquiring a highly competent staff, as has the agricultural research establishment in Mexico. On the matter of the optimum size of such centres all too little is known. No one to my knowledge has examined the complementarity among scientists with a view to resolving this issue.

A lone scientist is absurd; a small core may be far less than optimum. Our own experiences seem to support two inferences: first, research scientists should be an integral part of a college or university, and second, a number of competent persons no larger than that in most of our state agricultural experiment stations is inadequate. It may well be true that by this test less than ten of the agricultural research centres in the United States are of optimum size".

These were exactly the conditions and considerations under which every agricultural university in India is compelled to take decisions on reorganisation of research. The reorganisation attempted by the University of Agricultural Sciences, Bangalore obviously has taken into consideration the issues involved and discussed above. Thus, research is organised at five regional research centres of the State, one for each agro-climatic region, each equipped with high-grade scientific personnel who have at their disposal far better laboratory and library facilities than ever before. Problems were identified with care and priorities established and research has become a team effort and is conceived by faculty members; scientists and extension specialists after considerable deliberation and discussion. It is gathered that similar set-up is being worked out by many other universities. For the success of these regional centres the following conditions must be met: (a) projects of work must be well conceived and workers must have independence of action, (b) financial support should be adequate, (c) leadership must be established and mobility of workers should be avoided or mini-

mised, and (d) the centres should have coordinating functions with extension and feed-back of the farmer's experiences.

By establishment of regional research centers as described above, substantial gains were apparent. Repetitive petty efforts made in a very large number of centres by an assorted group of persons not necessarily qualified or fitted for research, causing the meagre available resources to be spread too thin on items of research having little or no bearing on the problems in the field, have totally vanished into the limbo of history.

Conclusion

A university is a place for intellectuals and a research centre for thinkers. Through ceaseless enquiry, they sustain a thread of innovation to prevent monotony and insipidity of life. They serve the community well. In the words of Einstein "only life lived for others is a life worthwhile".

Though difficult, one cannot hold the temptation to define the term "Research". Szent Gyorgui said that "Research is to see what everybody has seen and think what no body has thought". A more popular definition may be "is a process akin to searching a needle from a haystack". Search is inevitable whether the needle is present or not. To pronounce after search the absence or presence of the needle is the scientific truth. While science may never be wholly right, it certainly is never wrong"—according to Prof. G.N. Lewis. Science provides inexhaustible source for search by any for any length of time. It usually culminates in ushering new ideas and new innovations. It needs a specific environment and the only way by which it can be nurtured is through encouragement. Current methods of encouragement are stale and short-lived. But the one that arises from within the worker is permanent and productive. It arises in the man who ceaselessly pursues with steadfast zeal any problem—simple or complex. A description of this in the words of late Sir K.S. Krishnan* may seem appropriate. "The path of the scientist to probe into Nature's secrets is not a clearly laid out one with directions for entry and exit. The mysterious house of Nature has innumerable doors and win-

* From a lecture delivered by Sir K.S. Krishnan, F.R.S., at Indian Agricultural Research Institute in Jan., 1960 and recorded by the Junior author.

dows and it is for the explorer to use the keys of wisdom to open door after door and pursue the path which is perhaps endless. In this endeavour the scientist finds heavenly pleasure—one which can only be experienced and defies description in words". Those who experience that pleasure are to be honoured as scientists of the university (seat of learning) while all others remain adorned on pay rolls.

7. *Extension—Promise and Performance*

THERE are many factors that affect agricultural production but the final product is the result of an interaction between three factors (i) available natural resources (ii) the capital for investments and (iii) the knowledge that is applied to agriculture through people. The first factor represented by the soil, and water, and the climate, can be strongly influenced by the third factor the action of man. The second one, the capital available for investment used for different inputs, and fixed investments may run into waste if knowledge in the form of modern science and technology is not applied. Man is therefore a decisive factor in agricultural production.

The mechanism of acquiring and transmitting knowledge involves three aspects that are closely interrelated : first, the training of people in agriculture at different levels; second, the acquisition of knowledge through research; third, the transmission of this knowledge to the farmers for adoption in the field. These functions are obviously interdependent and therefore inseparable. An institution which effectively and successfully integrated the three is the Land Grant College of USA. The agriculture university set-up in India is a replica of that pattern and philosophy but adapted to suit the conditions in India.

While the functions of education and research are dealt with separately that of extension is discussed in some detail here, as on the success of this that the common man in the street, the people's representative in the legislature and the farmer in the rural area judge the performance of the university as an institution worthy for service or otherwise.

Foundations for Modern Agriculture

Traditional agriculture has attained through time an economic equilibrium where additional inputs of capital of traditional

type will return little or nothing per unit of investment. Many Government programmes of the past that attempted to intensify agricultural production have yielded scant productive results. The reason is not due to any inherent defect in agriculture but the absence of modernization of agriculture through adoption of "highly rewarding inputs". Without accepting, this to brand the farmer as "archaic and obstinate" has been the worst blunder of the past. Dr. David Hopper has well said "I have long ago lost tolerance with the argument that the farmer—his stubborn resistance to change, his fixation on tradition, his low aspiration—is the major constraint holding development in check. It is just not true".*

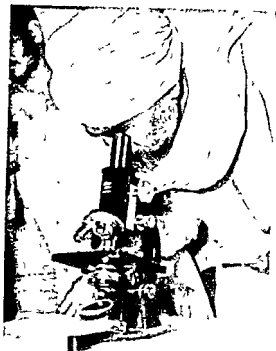
A well known British Economist, Sir Roy Harrod who was invited by Prime Minister Mr. Nehru to visit India to examine the fourth five-year plan then under drafting and tender advice with special reference to agricultural progress, made valuable observations reflecting his rich experience.

Sir Roy wondered if the unwillingness of farmers in some places to take advice is due entirely to their conservatism. In some cases, they may not be wrong in rejecting specific advice. Even in Britain, says Sir Roy, where the problem is tiny compared with that of India, and where agricultural science is highly advanced, it has been alleged that the advice given by Government committees has often been wrong. If a few case studies were made of the failure of communication between the extension services and village farmers in India, it might appear that the farmer is not always wrong in politely declining official advice.**

Quite recently the acceptance of high yielding varieties of rice and wheat by Indian farmers in place of those under cultivation since ages—despite several obstacles—is an eye opener to the fact that what is decisive for agricultural production is the "pay off" for an input plus a resourceful extension mechanism of transmission of this over the largest area in minimum period of time.

* "Investments in Agriculture—The essentials for pay off"—Dr. David Hopper. Proc. Symposium—Strategy for the conquest of Hunger—Rockefeller Foundation. P. 102. April 1-2-1963.

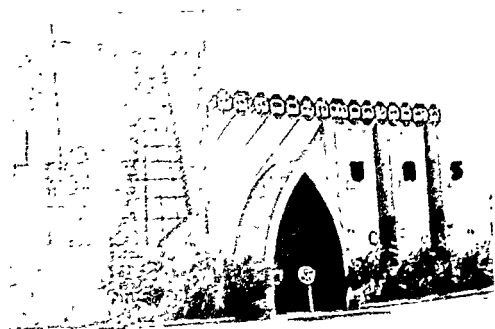
** "Time for new thinking on agriculture", by H. Venkata Subbiah. Hindu, April 16, 1965.



Cenoses are not common. A farmer from Haryana is looking through a microscope at an exhibition in Hissar.

"Question and Answer Session" at an Agricultural Exhibition in Hissar.





Exhibitions educate the farmers and the common man—UAS Plant Protection pavilion at the Congress Exhibition, Bangalore, 1968



Any programme to modernize agriculture successfully must be built on the following foundations : (i) new agricultural inputs that have a relatively high pay off are required (ii) supply of these inputs must be available to farmers (iii) as farmers accept them they must learn how to use them. These foundations essentially constitute the facets of successful extension work.

Extension—A Dedicated Mission

It should be made clear that extension is not mere sale of an improved seed variety or supply of a pamphlet of instructions regarding the usage of a pesticide or direction by a post card as to the name of the firm that supplies a specific fertilizer. It is a *dedicated and devoted duty of an individual who identifies himself with the community he is to serve*. His failures in the field constitute a feed back to the research worker. His role is a mission for life and is therefore indispensable. The extension officer should have clear vision of factual details of the recommended inputs, carry with him convincing argument, exhibit practical skill for demonstration and patience to follow up the trend of the performance. This is undoubtedly a tall prescription which many of the extension officers in developing countries do not possess. Dr. Hopper's observations appear appropriate "I have met only a few government officials in developing countries who have a clear vision of what is and what will be needed to modernize national agriculture. The absence of such a vision is perhaps the single most serious impediment to developing action strategies for rural economic advancement".

Dialogue to Develop Consensus

At a stage when a thorough transformation in the very organisation and working of the extension wing became necessary with the advent of the agricultural universities, innumerable obstacles of an unprecedented character came in the way. The extension wings of the State departments of agriculture are not in any way near to the university concept, not to speak of its smooth merger into the fabric. The fact is, these have become parallel and rival organisations with rancour and utter disregard to university policy. This is not singularly peculiar to this country. In a recent study of this aspect in developing countries it was observed ; "The development of an agricultural college's

other than servicing agriculture specifically. They have to evolve a new set-up which will serve as an effective vehicle of change and development.

5. The specific ways of carrying out extension to the farmer in his profession may be done somewhat as outlined below :

- (a) At the Block level an Agent of the university may be responsible for the work in more or less the same way as an agronomist among non-English speaking countries like Denmark.
- (b) These Block Agents of the University may be backed by a few subject matter specialists located at the District level, attached to the Experiment Station, to be the link connecting the research stations and laboratories with the Block Agents and the farmers.
- (c) This simple but effective medium of service to farmer will operate free of all direction from administrative elements who are non-specialists or have little day-to-day contact with farm people.
- (d) The university extension staff at all levels shall have to maintain close relations with the specific groups with whom they work.
- (e) Extension work has to vary greatly among the areas within a State in methods and subject matter content to suit our diverse situations, crops, farming methods, socio-economic conditions, living pattern and other considerations.

The Cummings Committee has this to say about extension service to be done by agricultural universities :

- (a) "The Agricultural University should have the responsibility for extension functions which are primarily educational in character. The extension training centres for training village level workers are required to be brought into close working relationship with agricultural universities as soon as possible.
- (b) On the central campus it is anticipated that there would be a Director of Extension who would be responsible to the Dean of Agriculture. Further, there would be Department of Extension Education

which would assume the responsibilities for training in extension methods including training of instructors for the extension training centres. Information officers and a publications office would be provided at the university. Each of the major technical departments of the college would have extension specialist(s) as members of the staff responsible on a technical subject matter basis to the Head of the Department but responsible to the Director of Extension for schedules and general field activities".

Extension by Central Government

The need for the Centre to have an Extension Directorate with a Farm Advisory Service and with the responsibility for training Village-Level Workers (men) and Gram Sevikas (Women) for agricultural publicity and information is not clear. Since the Centre has no close or direct relation with research in the States, it can offer precious little beyond what could be obtained through the State agencies and Central research institutions.

What happens in actual practice is distressing. The officers of Central Farm Advisory Service in their tours of different States attempted more to educate themselves than to understand and act on what is required of them. Largely assisted in drafting their reports by State officials who usually accompanied them, precious little of it was useful to the State officials. Granted that sporadic items of advice merited attention they reached their destination through long official channels, with the result their utility was attenuated. The organisation as a whole attempted a job of impossibility and has been described by many as a fifth wheel in the coach.

Extension by Private Agencies

The criticism that government extension agencies have frequently failed, is gaining ground day by day. This is further accentuated by private agencies carrying out extension work in certain specific areas. The remarkable success of these agencies and their extended area of operations hold a threat to the growth and functioning of the government extension departments. The

bifurcated agencies of extension existing partly with the department and partly with the university is the most serious impediment to progress.

In the year 1965 a suggestion was made to the British Economist, Sir Roy Harrod who visited India at the invitation of Government of India, by some one or presumably by a non-official agency that private enterprise might be enlisted in agricultural extension work. Some leading fertilizer companies, and other engaged in agro-industries like Hindustan Lever, are already rendering excellent extension services to the farmer. A large firm supplying fertilizer to a given region might use its own extension services so as to ensure prompt delivery of the fertilizer at the right moment on the one hand and to teach farmers to use it properly on the other. It is possible that villagers might instinctively feel that "commercial folk" might be knowing what they are talking about more accurately than district and block level officials.

Anyway, commercial agencies could be used for the good organisation and free service that they bring, without necessarily suspecting the competence of official agencies. The important thing is that farmers should take more inputs like fertilizers, seeds, implements and so on, and if they do so more readily on the advice of "commercial folk", the latter should be used in the interest of increasing agricultural production quickly, provided their object is service to the farmers rather than profit motive. If these folk can also provide the credit, it is all the better.

Work done in agricultural extension by Hindustan Lever in Uttar Pradesh is relevant in this context. It did not take long for the agricultural staff of the company to realise that talking to the farmer about the techniques of improved farming, and even organising demonstration plots, were not enough. Credit was necessary and the company arranged for it. In the company's peas farm at Ghaziabad (U.P.) the farmer is supplied chemically-treated seeds, fertilizers and pesticides on credit. These loans are in kind and interest-free. They are recovered from the farmer at the time he brings the harvest to the factory. Sometimes tractors and other agricultural implements are also supplied to farmers on hire by the company. If some farmers are unable to harvest the crop in time, the company arranges for it.

The company has successfully tried extension service for groundnut cultivation as well. As a large industrial consumer of groundnut oil in the country, it felt that it should do something to raise the deplorably low per-acre yield of groundnut. The experiment of persuading a small number of farmers to grow groundnut on scientific basis on partially irrigated areas was conducted last season in two districts of Uttar Pradesh. The extension project covered three blocks of 20 acres each and was operated by 64 farmers. The average yield per acre amounted to 1,500 lbs. (in shell) as compared with the national average of 700 lbs. Normally, groundnut in U P. is produced on single-crop lands and on marginal soils. Hindustan Lever has tried to evolve a new crop pattern in which groundnut is rotated with wheat. The company gives seeds, fertilizers and plant protection materials free of cost to farmers who agree to try out the new cropping pattern.

In the field of crop protection and supply of improved seed private agencies have made remarkable progress, right at the village level. If agricultural universities failed to exhibit the service-oriented philosophy for which they have been created, the influence of the private sector would be so strong that it would be impossible to compete, much less to replace it.

Extension in Japan

In Japan, it has been pointed out by a team deputed by Punjab Agricultural University (1965) that Agricultural Training Institutes located in each of 46 prefectures organise the training programmes for extension workers and these institutes are attached to the agricultural experiment stations where the extension subject matter specialists are also located.* Such an arrangement ensures, says the report, that the research worker as well as the extension specialist together with the regular staff of the training institutes are fully utilised in the training programme of extension workers. These training institutes impart training to farm advisors for two years after they pass out from High School.

It is also stated in the same report that the prescribed quali-

* Kanwar, J.S., Kirpal Singh and Cheema, A.S., A new strategy in agriculture in Japan and South-east Asia (June 1966), P.A.U. Press, Ludhiana.

fications for the subject matter specialists of Japan are that they should be graduates in agriculture with seven years of experience. Over and above these, they have also to pass the prescribed national examination for extension. The number of such subject matter specialists are stated to be 859 covering 25 specialised fields, while the number of farm advisors, who are more qualified and experienced than the Village-Level Workers of India, are stated to be 10,854, with another 2,320 home advisors who provide advice to the farm house-wives and rural youth.

Man as a Productive Agent

Factors of production or productive agents fall into two parts, one of which consists of "technological change", which is within the purview of research, educational and extension agencies, and the other consisting of "land, labour and capital". No reference is made here on the factors of land, labour and capital. But it is necessary to refer to the human agent who is after all the principal productive agent. The knowledge or know-how of how to employ each of the productive agents, including himself, is also an integral part of the factors of production. Without the acquired capabilities of farmers, the course of modernising agriculture will be greatly slowed down. Acquired capabilities are, therefore, a valuable investment in human capital, and a major source of economic growth from agriculture. The remarkable agricultural achievement in Israel with a land of poor quality was made possible by persons with grit, perseverance, and most of them with a high degree of education, who were able to assiduously acquire both the knowledge and skill needed for success under forbidding soil conditions. Japan was able to increase her agricultural production per acre to eight times that of India primarily due to the high level of mechanical farming skills and the high degree of schooling that the farm people acquired to absorb and adopt continuously the new agricultural factors specifically evolved by their scientists and tailored to the biological and other requirements of Japan. The transformation of agriculture in Denmark between 1870 and 1900 could not have been attempted without a large investment in the education of farm people in modern scientific agriculture.

Residual Functions of State Departments

The Committee on Agricultural Universities (Cummings

Committee) has made the following suggestions in regard to the residual functions of the State Departments :

Departments of Government where legal authority is necessary or where business transactions take place have a very vital and important role. In a developing economy these functions will become more important and of necessity of greater magnitude. Among these areas of responsibility will be marketing, processing, consumption, regulation, quarantine, services and supplies.

- Marketing* : Setting and enforcing grades and standards of agricultural commodities, labelling containers, storage facilities, transportation.
- Processing* : Grades and standards, plant sanitation and quality control activities.
- Consumption* : Product standard and purity of food.
- Regulation* : Weights and measures, seed purity and vegetables, fertiliser grades, formula labels, serums, vaccines, medicines, and drugs for livestock, insecticides, standard lables for using insecticides and fungicides and nursery stock standards.
- Quarantine* : Livestock diseases, plant diseases and insect eradication work.
- Service* : Vaccination, livestock treatment, spraying for insect and disease control of farm crops and livestock. Surveys to determine presence of dangerous population of insects, disease incidence or animal pests, collect and compile agricultural statistics.
- Supplies* : Since there is a limited supply of many necessary items of production, supply at the proper time and amount is vital. Assist farmer co-operative and local agencies in obtaining supplies of seed, pesticides, fertiliser, containers, trasportation equipment, foundation livestock and poultry, nursery stock, seedlings and etc.,

Integration—A Synergetic Merger

Even after nearly a decade there has not been a single agri-

cultural university in any state which emerged out with its full complement of integrated functions of teaching research and extension for satisfaction much less for pride. An agricultural University without its extension function is like the healthy tree which does not bear fruit. An extension department without the support of results of research soon fades and dies out. An agricultural university is still regarded as a rival organisation set up to annihilate the State department of Agriculture. This is just not the case. The fact is, retaining the importance of individual functions, a synergetic process is at work to bring about a merger. If we as a nation are to survive today and build a future for tomorrow, we have to bring the integration soon with the spirit of the well known axiom "to see without envy the glory of a rival shows a worthy man ; to rejoice at it a good heart but to contribute to it a noble soul".

8. *An Anatomy of Technical Assistance*

TECHNICAL assistance is essentially a problem-solving, service-oriented, community-related activity. It is expected to encourage and foster new attitudes, help establish lofty traditions and spirit of dedication. Yet another gain would be to pick up values, attitudes and operational norms that characterize successful institutions and which eventually contribute towards building up of institutional traditions.

The programme, however, is necessarily to be viewed only as an interim arrangement and must eventually yield place to technical cooperation when the developing countries become independent of technical assistance and begin to function as co-partners for mutual benefit of talent and resource. In fact, it is hoped that the sisterhood relationships now created between US universities and agricultural universities in India under the USAID assistance programme would develop into co-partnerships of an enduring nature based on professional bondages rather than on incentives, unilateral need, or governmental agreements.

In India it is essentially meant to improve the standard and quality of education, research and extension at the newly established agricultural universities. As the structure of these is essentially an adaptation of the land grant colleges of USA, it was only logical that the Government of India sought technical assistance from USAID to train their teachers, research workers, extension officers and administrators solely to imbibe the spirit and philosophy of land grant college.

Origin and Growth in India

Although a beginning was made as early as 1952 for extending technical assistance on an *ad hoc* basis through a contract with Illinois University, to the Allahabad Agricultural Institute, the credit for systematic promotion of this assistance programme

goes to Dr. Frank Parker, whose untiring efforts culminated in the signing of the operational agreement Number 28, "Project for Assistance to Agricultural Research, Education and Extension Organizations" in 1954. This agreement envisaged provision of capital inputs, equipment and books, US specialists to work at Indian institutions and advanced training of Indian staff members at US universities. Supplement to this agreement signed in 1955 enabled the participation of five US universities in the assistance programmes for strengthening agricultural institutions in India. Each US university was to work with a number of agricultural colleges on a regional basis. From a review of the impact of the programme it was realised that US technical assistance was spread too thin over many colleges and that there was need to concentrate on fewer institutions which had the necessary potential for development. The programme was accordingly reviewed in 1963-64 and the assistance was earmarked only for the development of agricultural universities in India. It was at this point that the sisterhood relationship between US universities and Indian agricultural universities started and has continued since, to the enrichment of the programme. Today, six US universities are extending technical assistance to eight agricultural universities in India.

Technical Assistance—Contents

What is expected by way of technical assistance from a contracting university will be evident in sufficient detail from the following excerpt from a university contract :*

The Contractor shall provide assistance to the (State) and the (University) to :

1. Further the integration of teaching, research, and extension in the pattern of the United States Land Grant College system ; strengthen research and extension to serve the agricultural needs of the (state) and other nearby areas and build the professional competence of agricultural specialists.
2. Strengthen existing programme at (university) and with the State and to develop new programmes of a more

* Building Institutions to serve Agriculture—Report CIC-AID. Rural Development Research Project 1968.

fundamental nature in the general field of agriculture and veterinary medicine.

3. Develop at (university) a graduate programme in Agriculture and the Rural Social Sciences leading to a degree similar to the Master's Degree in the United States. This programme will be a means of improving the qualifications of college professors, researchers, and other technical personnel.
4. Assist the (university) in a programme of increasing the number of undergraduate and graduate students enrolling annually from (state) and other areas in courses initiated in (date).
5. Strengthen the qualifications of the agricultural profession and provide training in the United States or elsewhere outside (country) for (country's) professors and specialists from (state) and other states.
6. Assist in the planning and development of the new... agricultural experiment farm to be used for education and research as an integral part of the (university).
7. Assist the (university) in undertaking economic research to guide State and Federal Agencies and cooperatives, farmers, and other private enterprises in (state) and neighbouring states.
8. Cooperate with the staff of the (university) in providing information and advisory assistance to private and public agencies in developing and carrying out effective economic development programmes to increase agricultural production and improve processing and marketing practices.

In brief, the staff of the new institution was to achieve a high level of technical competence and performance in the fields of teaching and research. This performance was to be on problems vital to the economic development of the country. In addition, the institution was to become a working partner with other segments of society in helping to resolve practical problems.

The US university was charged with the responsibility of developing within the host institution the basic attributes and characteristics of the land grant model in the US. Seven aspects of institution building as classified by several writers are (a) attitude and commitment, (b) organizational structure,

(c) programme, (d) physical facilities, (e) integration within society, (f) input, and (g) output.

With special reference to the Indian scene the more potential and rewarding technical assistance relates to (a) the participant training programme (b) physical facilities inclusive of campus development (c) expertise for specific research projects of crop improvement through inter-disciplinary research.

The nature and quantum of assistance received on the above aspects are discussed below. To appreciate this it would be necessary to have a knowledge of the conditions of the under-developed countries in contrast to the US which offered the technical assistance.

Conditions in Under-developed Countries

Over the past century the land grant colleges have been engaged in the necessary basic and applied research and in the development of principles, policies, and procedures for the *improvement of agricultural production and the development of the rural economy in the US*. Many of the basic facts and principles developed during this period have proven to be useful in some regions of the world. It would be totally wrong to assume that this knowledge and experience when applied would solve the problems of less developed countries of the tropics. This has not been the case for some reasons.

In the US there has always been a supply of potentially good agricultural land beyond that needed to produce enough high quality food to meet the needs of the nation. In many of the less developed countries with large populations, the quantity and quality of food production are pitifully inadequate for the number of people and there is little new land available for development. In the US rural development has occurred under overall conditions of continued labour shortages, even though there was a labour surplus on the farms—in other words, economic and industrial development have kept pace with the growth in population. In many of the more populous and less developed countries, population has grown faster than food production and industrial development remained without any appreciable growth.

In the United States the infrastructure serving agriculture developed as rapidly as agricultural production increased. In

fact the developing infrastructure served as a stimulus to agricultural production. In most of the developing nations the infrastructure serving agriculture is inadequate to serve the needs. One cannot overlook the fact that public policies of the United States dealing with land settlement and ownership, credit, prices, and marketing have always favoured increases in agricultural production. This is not true in many of the less developed nations. All of these differences between conditions in the United States and in the less developed nations pose new problems for the agriculturists and others of the US who willingly undertook to assist less developed nations to step up their rural economies. In addition, each developing country has its own culture, traditions and taboos and any one of them is nearly or wholly incompatible with that in the US.

Apart from social and economic differences between the US and the less developed nations, wide differences between agricultural production in the temperate and the tropical regions need clear recognition. The same basic facts and principles guide plant and animal growth in all climates. But the application of these principles to agricultural production under tropical conditions present many new and peculiar problems to the US agriculturist.

Some agricultural experts of US technical assistance programme appropriate to their functioning concerned themselves to tropical agricultural methods. The research programmes of the colonial powers in tropical agriculture had concentrated on the export crops such as sugar, coffee, tea, cocoa, rubber, spices etc. Native populations had not outgrown the native supplies of the traditional foods in most of the less developed countries and hence, there was no pressure for adaptive research directed to the increased production of food. A tremendous population increase during the last two decades in many of the developing nations resulted in serious food shortages. The need for and value of adaptive research is highlighted by significant increases in crop yields now being secured in many areas by the introduction of newly developed, high-yielding strains of the food grains, together with the adoption of appropriate agronomic practices and crop protection methods.

It is now clear that in the absence of adaptive research such increases in production would not have occurred. Continued

assistance therefore becomes inevitable for such time till the infrastructure serving agriculture is sufficiently strong to sustain the achieved results.

Participant Training Programme

The quality of an institution essentially and primarily depends on the quality of its personnel. They will determine the nature of the programme, its relevance to the country and the vigour and competence with which programmes will be pursued; and these in turn will affect almost completely the level of support which the institution receives from public and government. For these reasons participant training programme is undoubtedly the most important singular element in the entire technical assistance process.

From the stand point of the host institution the objectives of the participant programme are more nationalistic in character with its strong sense of urgency for building indigenous institutions which can be freed as soon as possible from reliance on outside world for direction and technical training. There is a much stronger sense of urgency on the part of host institution leaders for the trainees to obtain degrees, titles or other certification that they are indeed modernised in the eyes of the world. It is a fact that rarely was a participant programme found that was based on filling deficiencies in specific institution's blue print. The fact is that universities have rarely drawn a blue print with clear vision and with relevance to its immediate problems.

The individual trainee has an object which is strongly self-centered with a view to improve his own economical and social status whether his future is tied up with the current employer or elsewhere. His interest in the programme is more to make him marketable than to fill a specific void at his own institution. Thus, the objectives of the participant and sponsoring institution are highly incompatible. It is a common experience to send a participant along a highly practical line as a means of satisfying a serious need within his institution. On arrival in US however, the participant usually makes every possible effort to convert his programme into one of obtaining an advanced degree. The fault is not with the participant as the

country that sponsored him places undue regard and weightage on a degree than practical competence gained.

The joint programme now current in India, first in one of US university for course work followed by research on a chosen problem at IARI is not appreciated by many of the participants. As one participant remarked "Is it necessary for an Indian to fly 10,000 miles to read the same text book that is already available in India and attend monthly tests on the American soil". Our institutions and professors are well-equipped to do this job. If the present exodus to foreign countries is stopped and institutions in India given the needed encouragement without external interferences, at no distant date Indian institutions would set an example to many others for their efficiency and effectiveness. Hunting for degrees abroad should be discouraged. It is gratifying that the USAID and ICAR are planning to extend the joint programmes to a few other Indian Agricultural Universities such as in Ludhiana and Bangalore.

Non-Degree Participant Programme

Nearly 64 per cent of the participants usually carry a degree programme while the rest under the non-degree programme is usually of two kinds. One group consists of administrative personnel who were sent on short term assignments to observe administrative procedures and institutional organisation and to gain broad perspectives of institutional role and operations. The second group are technical personnel deputed on short term assignments to gain knowledge about specific technical areas or to gain competency in certain technical skills or operations. These programmes operated by the contracting university and AID have been found, almost in all cases, extremely productive in upgrading technical capability for working at home with confidence. As an additional dividend, both groups generally returned home as appreciative ambassadors of international good will.

Apart from this, host institutional leaders were taken to US and other countries to give them first hand observation of how institutions function and their relationship to the public. Top officials of the contracting university were also allowed to visit institutions of the developing countries to make a study on the

spot, how effective the technical assistance programme was. All these visits have had a great impact in elevating the ceiling of comprehension, vision and determination in individuals who determine policy and make overall decisions in the host country.

Returned Participants

Several of the returned participants bitterly complain about the equipment of our institutions and working conditions. Although they are not entirely wrong, theirs is a negative approach and sooner or later they will be a burden to themselves. To such men the only answer or advice will be as what Late Dr. H J. Bhaba said "*for thousands of scientists who can do good work in a good environment there is perhaps only one who like Rutherford can create his own environments wherever he may be*". Equally appropriate would be what late Dr. Haldane said "*when you do not have ideas you go and look for the equipment*". This is not to minimise the importance of modern sophisticated equipment in our institutions but only to stress the fact that it is the mind of man that is still the most potential and powerful of all instruments.

The blame that is usually plied on the Agricultural Universities in India by many of the returned participants is on low or inadequate emoluments paid. This is totally false and entirely not relevant to the Indian situation. A promotion of an instructor to an Associate Professor, the offer of the post of a professor to a young doctoral degree holder without a single published paper to his credit and similar rank even to a second class M.Sc. is still regarded by many as not sufficient incentives for work. Few returned participants have kept alive academic link with their Professors in the US. All the while many of these returned participants are at work to obtain some extra-curricular assignments of monetary benefit however harmful it is for their legitimate work. From these one may infer although the participant programme has created a new class of society at the campus and has been therefore a burden on the university. Based on such an experience the participant programme needs suitable changes.

It should not be concluded from what has been said that there is no need at all for agricultural scientists of India to

visit advanced countries of the West. However divergent we are from the West in agricultural pattern and production, the techniques involved in research methods are common and it is in rapid evolution of improved techniques that advanced countries take a big onward march in crop production methods. The Indian scientist who goes abroad should at the outset have a clear picture of his requirements at home and be in a position to discuss, more or less at similar level, with the foreign expert and get a broad based training in those aspects which he would profitably use on his return.

There are innumerable instances when professors in the Universities abroad expressed unhesitatingly their appreciation to have with them those Indian scientists who are already engaged in India, over a reasonably good time on a problem of importance to India.

Indian students will do well to first take their highest degree in the concerned subject in India. They can choose research, teaching or extension as their career and join any department or institution to work with zeal and steadfastness for about ten years. By then each teacher or scientist would be in a position to judge the dimensions of the problem of his interest and be fully aware of the institutions and professors abroad who have similar problems for work. The Government should offer at this stage liberal terms of deputation for the candidate to contact and learn in the institutions abroad for periods varying from a few months to a year or more. This can profitably be repeated at intervals of a few years. It will then be possible to build a team of scientists of experience and repute in different branches of agricultural science. Senior scientists should be charged with the responsibility of training their juniors to take their place in turn and not create a vacuum. The secret of success of the West is that in all fields of study they have enough dependable men in the assembly line to take the place of the retired or dead. After Sir John Russel the world famous Agricultural Institute at Rothamsted never pronounced the absence of a suitable scientist, and had no need to think of in-charge arrangements. It is sad that in many institutions in India several retiring scientists leave a remark that no suitable person is available to be his successor. Such tragic instances are common. One should emulate the American saying "every

American citizen is a potential candidate for the American Presidency".

Technical Expertise

Equally important and perhaps even more effective than participant training programme is the assignment of technical experts to assist research or extension projects which directly or indirectly help in institutional building.

Today the US can be proud of a huge reservoir of high quality professional men estimated at 30,000 agricultural and home economics professional workers at the land grant colleges and research stations. The use at any one time of about 500 of them to technical assistance in various developing countries will mean trifling in cost, but the concern it causes to the domestic work at the US universities may indeed be considerable. It is also stated that in the US a real shortage of trained agriculturists is being felt in the land grant colleges, and therefore there is some difficulty to recruit men of desired quality for their domestic programmes.

An analysis of those who have been on various periods of assignment in the developing countries has revealed that some of them have only bachelors degrees, and nearly half possess a doctoral or professional degree. About two-thirds are in the most productive age period of 35 to 60. Although the overall quality of the US technicians sent out is reasonably good, and a few outstanding, certain deficiencies are, however apparent. Possible improvements, in the quality are said to be limited by four important factors :

- (i) departmental programmes in universities generally suffer when key staff members undertake two-year or longer foreign assignments;
- (ii) the professional growth and careers of faculty members may suffer when they undertake long-term foreign assignments;
- (iii) inadequate attention has been given to the development of job descriptions in the planning of projects, with the result that personnel have sometimes been mis-assigned;
- (iv) internal and external pressures have sometimes caused

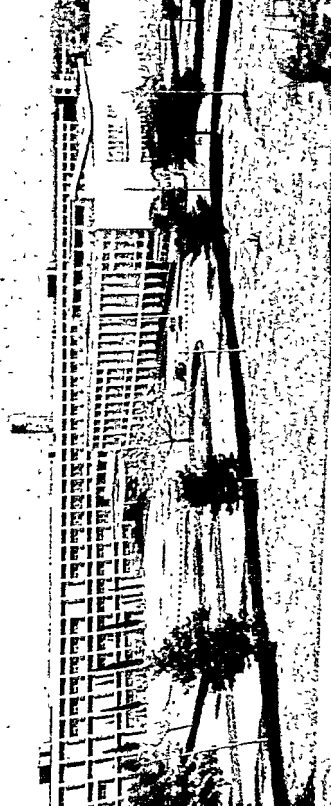
universities to accept overseas loads which were heavier than their capabilities.

Tardy progress in technical assistance in certain cases has obviously some valid reasons. Not infrequently the host governments lack clear vision of the areas where expertise is required. Experts from abroad seldom possess more than superficial understanding of the agriculture of the country to which they have been assigned and more often than not a very poor understanding of the peculiarities of Indian governmental and administrative set-up. Absence of cooperation between the expert and the host government officials is therefore not unlikely. Nevertheless, in a majority of cases the success owes largely to strong host country commitment and leadership. This is best illustrated by the remarkable success of the technical assistance of the Rockefeller Foundation experts working with Corn and Sorghum improvement projects in India during the past few years and of the Ford Foundation experts working with the (IADP) Intensive Agricultural Development Programme and agricultural universities.

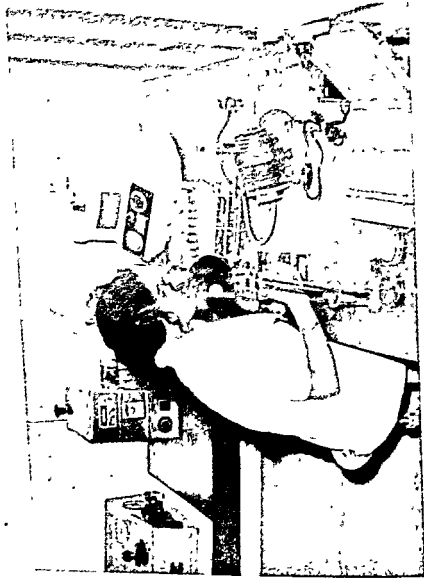
Campus Development and Equipment

Among other forms of assistance, that relating to campus planning and development deserves special mention as this is one of the most permanent benefits conferred in a developing country where knowledge for it is totally absent. The efforts of some American architects in planning campuses at some agricultural universities are praiseworthy, as what we see in these institutions today is akin to a physical transplantation of US land grant college campus to the Indian soil, but modified to suit the local taste and requirement.

Any research programme in agriculture today requires modern tools and gadgetry. Even in teaching the audiovisual aids are of considerable significance in modernising teaching and making it more effective from the students' stand point. A modern library should provide current books and periodicals in all disciplines relating to agriculture which many of the developing countries can ill-afford. Apart from these and multiple number of text books, photocopying, microfilming facilities are necessary. US technical assistance through contracting universities at all the agricultural universities has been substantial



A part of the gigantic campus of the PAU, Ludhiana -- A tribute to the genius of the Vice-Chancellor, Mr. Tiwari



Modernisation of research laboratory under US Aid Programme—UAS, Bangalore

in this regard, and in many cases it was further strengthened by generous grants of Ford and Rockefeller Foundations. Students' teaching laboratories in biological and physical sciences have also been upgraded by supply of suitable equipment. Research laboratories had a generous supply of all modern precision instruments, colorimeters, pH meters, chromatographic equipment, spectrophotometer, ultra centrifuge and many others.

In many cases the flood of equipment available is in utter disproportion to its requirement for teaching or research or both. All attempts at correction of this defect failed as equipment when once received at an institution is jealously guarded as a matter of prestige at all costs. Instances are not few when for want of knowledge in operations, the instrument remained unused, while misuse resulted in breakdown. By the time attempts were made to obtain some spare parts, that very instrument or specific model may have become obsolete and gone out of manufacture in USA. Equipment received as gift seldom received the same regard and respect that was given to one purchased from the funds of host government. Much of the sophisticated equipment has therefore become a stock-book burden.

Since the proposal to start advanced centres on specific subjects at chosen university centres is now being contemplated, the future policy should be to concentrate on building up modern facilities at these centres strictly in proportion to the nature and quantum of work. As research students move within the university area to use any specific equipment a healthy integration between departments and campuses becomes possible. Agricultural universities should also organise within their areas short courses to train staff members in instrumentation such as electron microscope, atomic absorption, polarography, chromatography etc.

Evaluation of Technical Assistance Programme

A process of evaluation to measure the impact of technical assistance for achievements of the objectives is always desirable by the donor and the recipient. On one hand, the donor is to be relieved of the burden sooner or later and the recipient should attain maturity at the earliest to stand on his own. If

the assistance is rewarding and the response by the host is encouraging, the donor would be encouraged and be willing to continue the assistance. The host institution needs such evaluation once in five years at least in an atmosphere of mutual interest and concern. The results of such evaluation should be considered as a basis for determining the best combination of technical assistance inputs as well as the area requiring concentration of host institution's resources later. The process of evaluation is indeed a complex one and the norms set for it may not be of universal application. Some of the areas that need evaluation and its content are indicated below :

Teaching : Teacher's attitude toward his major function, relationships with students and execution of this function; teaching method employed to achieve objectives; and relationship of subject matter content to the country's needs.

Research : Volume and productivity of research, proportion of projects directed to high priority problems, and capability of staff for documenting country's needs.

Extension Education : Definition of extension function by the university ; identification of priority activities with country's needs ; coordination with other agencies ; improvement of system (organizational self-improved activities) ; use of such principles and processes as group dynamics, local leadership, and community organizations; and focus on best technology.

Administrative Incentives : Stimulation of professional improvement, recognition and reward for excellence, delegation of authority, sharing in making professional decisions, effective use of controls, and development of public support.

Summary

Economic under-development is itself largely a consequence of institutional under-development. Countries anxious for rapid economic progress must be willing fundamentally to alter their institutional structures. Institutional transformations and development called for in an under-developed country will be deep, profound and far-reaching. Essentially, natural resources need to be exploited to the full for which attitudes should be altered and skills stepped up through education. To all this experience of developed countries with men and materials

catalyse to generate optimism and confidence. Transformation once set would gain momentum to proceed towards maturity. To the donor of aid it is an exciting task and to the receiver it is a noble venture for "He who loves not his country can love nothing".

9. *USAID and US Foundation Role*

For some time in the past the yard stick of measurement of affluence of a country has been the amount of steel produced or the news print manufactured per year but later the shift has been the food, clothing and shelter that a country could give to its people for health and contented living. It was soon realised that about half the human population on earth have an inadequate diet and millions live constantly on the edge of starvation despite the fact that an overabundance of food is produced in a few technologically advanced countries. In the past two decades the peace of even the affluent countries was frequently punctuated by unrest and tension for a variety of complex reasons. That a large part of the thickly populated world with inadequate food, clothing and shelter cannot coexist with a small part of the affluent population in peace was soon realised. The first pragmatic approach to solve the problem was the generous and lofty ideal of the affluent nations to extend a helping hand to the needy nations through economic aid and technical assistance. As many as twenty countries reckoned as developed nations determined to lend assistance, in proportion to their ability, to the under-developed countries and of this the US assistance is outstanding for its quantum and area of spread. Apart from individual country's contribution international organisations like the FAO, UNESCO, World Bank and IDA have come into being for furthering this worthy cause. The philanthropic ideals and generosity of the Rockefeller and Ford Foundations had the desired global impact and considerably reduced if not abandoned, food deficiency in some of the underdeveloped countries. The success of all the endeavours mentioned has been the tacit realisation that improvement of agriculture is the essential basis for industrial footing and growth leading to desirable standards of living in the under developed countries. To this

end the work and accomplishments of USAID and of the Ford and Rockefeller Foundations for agricultural development in India—a vast subcontinent of Asia, a dynamic democratic force with determined effort and action to take the best of the aid and assistance offered to attain self sufficiency in food has many facts and facets of sufficient interest for record here.

Operational Agreement—28

The Government of India and the United States of America have many common interests. They are both democratic countries and have large geographical space. Both recognize mutual interests in many important problems. Through the Technical Cooperation Mission, the United States has been cooperating with the Government of India since 1952. In 1955 an addition to the programme was made through Operational Agreement 28 described on page 19.

Survey teams of the 5 US Universities visited the Indian institutions and had discussions with members of the Central and the State Governments and representatives of Indian institutions. These meetings helped the US teams to assess the progress made, recognize some of the major problems and understand something of the planning for the future. On their return, the teams reported their observations to their home campuses with suggestions on how best mutual benefits could be realised from a cooperative programme.

As a sequel to these survey team reports and recommendations, the five US Universities entered into contract early in 1956 to provide the services.

Each of the five Universities in the US agreed to send selected staff members to India. Each staff member, in his respective field of competence, was to be available to contribute to the teaching and research programmes of all agricultural institutions in the cooperating States. But this was later amended to restrict their activities to only those states which decided to develop an agricultural university.

The US Universities also offered training facilities for a number of Indian students in order that they may be better prepared for responsible positions in the Indian programme.

Operational Agreement No. 28 between the Government of India and the US Government provided as one major

phase of the project the constitution of a joint team consisting of the representatives of the Indian Government and three American specialists in agricultural research and education to make a comparative study of the organisation, functions and operation of Indian and American agricultural research and educational institutions as a basis for developing recommendations for strengthening the programme of research and education in India. This was the first joint Indo-American Team whose review on agricultural research and education has been dealt with elsewhere in this book.

The paths of the University Survey teams crisscrossed with those of the First Joint Indo-American Team and this must have resulted in a certain amount of cross-fertilisation of enthusiasm and ideas.

The period of the programme of the five US Universities in India unquestionably coincided with a period of tremendous and unprecedented institution-building in India. Many new institutions were started and several developed rapidly, and a few were transferred from mere colleges to universities more or less on the model of Land-Grant Universities of the US. New libraries, widespread adoption of the open shelf-system, new and greatly expanded postgraduate training facilities, improvements in teaching, research and extension, new university campuses dotted all over the Indian scene, are the developments which reflect the progress made after April 1954, when the cooperative programme was signed as OA No. 28. By any standards this progress during a period of a dozen years is phenomenal and the person who, as an individual, had much to do in conceiving the programme was Dr. Frank W. Parker.

USAID—For Agricultural Development

India's new agricultural strategy is focussed on combining high yielding varieties of cereal grains with a "package" of agricultural requirements—fertilizers, pesticides, improved farm equipment, credit, and grain-storage facilities—in areas assured of sufficient water for irrigation. Currently the United States is providing support to vital segments of this new agricultural strategy.

Few are aware that no less than 57.8 per cent of the total

foreign aid from different countries of the world received by Indian during the period of April 1951 to September 1969 comes from USA alone. Few only know that 40% of the US aid is directed towards the development of agriculture in all its aspects. This massive aid may be categorised for (i) Establishment of Agricultural universities, (ii) Crop improvement, (iii) Supply of fertilisers and pesticides, (iv) Provision of US expertise, (v) Training of Indians in US Universities, (vi) P.L. 480 programmes and (vii) Miscellaneous.

All these aspects are interrelated and a summarised knowledge of these would enable one to understand the quantum of assistance, and its impact on the growth of agriculture of the country as a whole.

(i) Agricultural Universities

The establishment of Agricultural Universities on the pattern of the Land Grant Colleges of USA is undoubtedly the plum of the USAID programme. It is not only massive in character, but bold and pragmatic in its approaches to bring a revolution which may ultimately prove to be highly rewarding. The dimensions of this programme is so vast that it necessitated the writing up of a separate treatise of the kind that is envisaged by the authors in this book. Today more than ten agricultural universities cover a large area of this vast country. The vital segments of USAID assistance for this reformation consist in (i) provision of technical expertise under the direction of five contracting US Universities viz, Kansas, Ohio, Tennessee, Missouri and Illinois, (ii) training of Indian teachers and research workers at US Universities for varying periods to understand and assimilate the new concept, gain new knowledge and skills and to feed back the experience gained at the home country, (iii) upgrading physical facilities such as through campus planning, supply of modern tools as laboratory equipment, and addition of books, periodicals, etc. to the libraries. Statistical information in the quantum of assistance offered for these three vital purposes presented here even at a rapid glance reveals that the total cost of inputs for eight universities between July 1963 to June 1969 comes to more than 10 million US dollars (about Rs. 7.5 crores). That a problem so huge in its dimensions and complex in character has been attempted

to be solved with skill, ingenuity and patience, apart from provision of required money and goods, is indeed such as to create a unique chapter in the history of the country.

**USAID TECHNICAL ASSISTANCE UNDER AGRICULTURAL
UNIVERSITIES DEVELOPMENT PROJECT
JULY 1, 1963 THROUGH JUNE 30, 1969**

Cost of Inputs in Dollars

<i>Agri. Uni.</i>	<i>Personnel</i>	<i>Participants</i>	<i>Commodities</i>	<i>Total</i>
OUAT	851,000	279,000	105,000	1,235,000
MUAS	925,000	334,000	160,000	1,419,000
APAU	1,231,000	237,000	178,000	1,646,000
PAU	742,000	381,000	161,000	1,284,000
UOFU	805,000	348,000	98,000	1,251,000
JNKVV	963,000	280,000	101,000	1,344,000
UPAU	1,224,000	284,000	312,000	1,820,000
MAHARASHTRA	136,000	9,000	2,000	147,000

NOTE: Prior to July 1, 1963, USAID Technical Assistance was provided to Agriculture and Veterinary Colleges on a regional basis. Details for individual Universities are not therefore available.

**USAID TECHNICAL ASSISTANCE UNDER AGRICULTURAL
UNIVERSITIES DEVELOPMENT PROJECT
PARTICIPANT TRAINING
JULY 1, 1963 THROUGH JUNE 30, 1969**

<i>Agricultural University</i>	<i>Degree</i>		<i>Non-Degree</i>	
	<i>Number</i>	<i>Man-Months</i>	<i>Number</i>	<i>Man-Months</i>
OUAT	30	625	13	142
MUAS	35	610	7	29
APAU	29	525	16	186
PAU	31	804	11	162
UOFU	33	824	11	136
JNKVV	17	376	28	303
UPAU	33	735	14	188
MAHARASHTRA	5	60	—	—

NOTE: Prior to July 1, 1963 participants were sponsored by Agriculture and Veterinary Colleges on a regional basis from all States in India. Thus, they are not identified with any specific agricultural university. The numbers prior to July 1, 1963 are :
210 degree participants for 3,248 man-months
223 non-degree participants for 2,338 man-months.

**USAID TECHNICAL ASSISTANCE UNDER AGRICULTURAL
UNIVERSITIES DEVELOPMENT PROJECT
JULY 1, 1963 THROUGH JUNE 30, 1969**

U.S. Personnel

<i>Agricultural University</i>	<i>Long Term Specialists</i>		<i>Short Term Consultants</i>	
	Number	Man- Months	Number	Man- Months
<i>OUAT</i>	14	290	3	5
<i>MUAS</i>	13	311	8	24
<i>APAU</i>	18	321	11	39
<i>PAU</i>	15	307	10	33
<i>UOFU</i>	12	308	3	9
<i>JNKVV</i>	12	219	21	67
<i>UPAU</i>	16	344	18	49
<i>MAHARASHTRA (MPKV)</i>	2	24	5	15

NOTE: Prior to July 1, 1963 USAID Technical Assistance was provided to Agriculture and Veterinary Colleges on a regional basis. Details for individual Universities are therefore not available. The number of specialists and consultants prior to July, 1, 1963 are :
82 specialists for 2074 man-months
14 consultants for 42 man-months

(ii) Crop Improvement

The assistance afforded through Ford and Rockefeller Foundations for crop improvement have already been dealt with in detail elsewhere. Under contract with the International Rice Research Institute, USAID has been providing technical assistance since 1967. Four scientists have been provided to work at the Rice Research Project Headquarters Rajendranagar, Hyderabad, since early 1968, and a few Indian rice scientists are being sent to the Philippines for advanced training.

A team of American specialists is participating in the project of extensive research in pulses with a view to evolving more productive varieties. A large number of pulse varieties grown in India and the Middle East has been collected. Tests on their yield performance are being carried on in many States. Research in breeding new varieties has also been undertaken.

(iii) Supply of Fertilisers and Pesticides

During the past five years the amount of fertilizers used by Indian farmers has increased (in terms of nutrients) from

400,000 tons to two million tons. This is largely because the new high-yielding varieties respond extremely well to fertilizers, and farmers thus find fertilizer application more profitable than in the past. The demand for fertilizers has outstripped supply, despite increased domestic production and greatly increased imports. The US aid programme has assisted the establishment of three large fertilizer factories, at Visakapatnam, Trombay, and Madras. Construction work is expected to commence shortly on a two-unit fertilizer complex at Kandla and Kalol, and a fertilizer plant in Goa. The United States is providing assistance to both these projects.

India presently produces 70 per cent of the total quantity of pesticides applied by her farmers. US non-project loans finance the cost of importing technical-grade pesticides which are then formulated in India. A considerable portion of India's domestic production of pesticides is accounted for by joint Indo-American private enterprises, which have received loans from the US Government. A considerable part of the fleet of planes now engaged in aerial spraying in India is of American origin. The Indian Government allocated 1.5 million dollars (Rs. 1.13 crores) from a US Export-Import Bank line of credit to purchase 24 additional US spray aircrafts, of which 17 are now in India and seven are on the way.

(ii) Provision of US Expertise

At the request of the Government of India, USAID has arranged for teams of American experts to serve in seven States: Andhra Pradesh, Bihar, Gujarat, Tamil Nadu, Maharashtra, Mysore and Orissa. The teams which normally consist of half-a dozen specialists, have helped Indian scientists and extension workers in identifying and solving problems encountered by farmers.

Since 1951, as many as 2825 American specialists have served in India, sharing their skills and experience with their Indian colleagues. At any one time about 200 US specialists are present in the country. The specialists assigned for agricultural development served such disciplines as agricultural education, agronomy, soil and water management, entomology and plant breeding. Indian officials sent to the US for advanced training in various fields come to 5406 and more than 50% of them were in agricultural sciences alone.

India made significant progress in increasing the area under irrigation, from 56 million to 89 million acres during the past 18 years. Emphasis has been placed on efficient utilization of the water so as to obtain maximum benefits. At the request of the Government of India, USAID is providing assistance to programmes for developing additional water and properly managing India's soil and water resources.

Four American specialists work with the Water Management Unit of the Ministry of Food and Agriculture to assist the Government of India in developing programmes and establishing technical standards for soil and water management on rain-fed and irrigated lands. At the Resource Inventory Unit of the Ministry, one specialist assists in compiling information about India's soil and water, so that it can be used in planning and implementing agricultural programmes. Two additional technicians (a surface-water hydrologist and a sedimentationist) have been requested by the Government of India to work with the Land wing of the Ministry of Food and Agriculture.

To assist State Governments and to demonstrate improved water management methods to farmers, USAID is helping three pilot projects near Bellary (Mysore State), Patiala (Punjab), and Dhorighat (Uttar Pradesh). On these projects, teams of engineers, soil scientists and agronomists help plan and apply programmes designed to give optimum benefits through proper water use and consistent with the conservation and maintenance of the soil.

(v) Training Indian Scientists in US

Commonly known as the Participant programme, an excellent opportunity to study in US universities is given to teachers, research workers and administrators of erstwhile agricultural colleges of India so as to enable them to acquire new knowledge and skills for application in development of Agricultural University in their home country, on return. A detailed consideration of the various aspects of this programme is presented elsewhere in this book.

But for the participant programme the introduction of trimester system, and internal evaluation would have been impossible. Where the returned participants were available in large numbers and where adequate orientation was arranged

for the benefit of others who had not been previously exposed to these systems, either through frequent seminars prior and subsequent to the introduction of these new systems, or through periodic subsequent assessment and analysis, the change from traditional to newer ways was a smooth-going affair.

(ii) *PL 480 Programmes*

Agricultural commodities supplied to India under PL 480 programme have played a vital role in combating food scarcity and reducing inflation. There are two titles of this programme—under title I, US sells agricultural commodities to developing nations on concessional terms. The value of the commodities covered by all PL 480 agreements is \$4,637 million and this is repaid by India in rupees. Title II provides for donations of agricultural commodities to help meet famine or other urgent extraordinary relief requirements and to combat malnutrition especially in children. The distribution of commodities in India is through voluntary agencies such as CARE (Cooperative for American Relief Everywhere), Catholic Relief Services, Church World Services, and Lutheran World Relief. The Indian programme is very largely (90%) directed toward raising the nutritional standards of 12.2 million school children and 3.4 million per-school children. US grants and loans totalling Rs. 121.13 crores from PL 480 funds are meeting a substantial part of the expenses of Government of India for development of elementary education.

From the portion of PL 480 sale proceeds reserved for US Government uses, the Agricultural Research Service of the US Department of Agriculture has extended some 314 grants to finance research in 85 institutions located in all parts of India. Research performed by Indian scientists on these projects has been of value to a global development of agricultural science. Future potential benefits are enormous. Subjects of study include the development of new or extended uses of agricultural products, marketing economics, human nutrition, and all aspects of farm and forest research.

Taken together, the PL-480 agreements with India provide for a total supply of 51.1 million tons of wheat, 5.5 million tons of sorghum and maize, 1.8 million tons of rice, 3.6 million bales of cotton, 431.700 tons of vegetable oil, 170,000 tons of

tallow, 7,400 tons of tobacco, 24,900 tons of non-fat dry milk, 13,000 tons of evaporated milk, 230 tons of whole milk powder, 400 tons of tinned fruit, and 80 tons of cheese. Most of these commodities have been received by India. The value of commodities covered by all PL-480 arrangements is \$4,637.0 million (including some ocean transportation costs).

PL 480 RUPEE RESEARCH GRANTS AWARDED TO
AGRICULTURAL UNIVERSITIES

5/26/70

1961-1970

<i>Name of Institution</i>	<i>Location</i>	<i>No. of Grants</i>	<i>Amount Rs</i>
Andhra Pradesh Agricultural University	Hyderabad	3	386,775
Haryana Agricultural University	Hissar	2	863,505
Jawaharlal Nehru Krishi Vishva Vidyalaya	Jabalpur	3	575,030
Punjab Agricultural University	Ludhiana	12	3,466,392
U.P. Agricultural University	Pantnagar	5	1,536,759
University of Agril. Sciences	Bangalore	5	930,515
University of Udaipur	Udaipur	7	2,297,855
Total Amount			10,056,831

GRANTS FROM US PUBLIC LAW 480 SALE PROCEEDS

	<i>Rs. Crores</i>
1. Agricultural Universities Development	0.62
2. U.P. Agricultural University	1.22
3. Modern Storage of Foodgrains	14.04
4. Dairy Development	0.07
5. Soil and Water Conservation	10.08
6. Agricultural Refinance Corporation	5.00
7. Exploration of Groundwater Resources	0.80
8. Beas Dam	3.00

Miscellaneous

The United States has also supplied iron and steel for making agricultural implements, soil testing equipment, trawlers, boats, and cold storage for fishery modernization, tubewell casing and machinery for boring tubewells, tractors, combines, and other agricultural machines, modern silos, and dairy and poultry equipment.

Regional colleges of education established at Ajmer, Bhopal, Bhubaneswar and Mysore provide training to both teachers and students in the field of Agricultural Technology and Commerce. Science education received considerable assistance through such vital programmes as Summer Science institutes, subsidised text books, teaching aids and establishment of Indian Institute of Technology at Kanpur with a modern IBM computer system.

Rural electrification helps increase food production through energization of pump-sets connected to wells and tubewells. Electric power is also useful in the efficient processing of food-grains and the creation of modern storage facilities. In the United States, cooperatives play a significant role in this field. At the Government of India's request, USAID arranged for visits by officials of American cooperatives to India to investigate the possibilities of establishing cooperatives to distribute power in rural areas.

Under a contract with USAID, the National Rural Electric Cooperative Association of America (NRECA) sent three teams to India. Along with officials of the Central and State Governments and Indian cooperatives, the teams conducted detailed studies on the establishment of five pilot cooperatives—one each in Andhra Pradesh, Gujarat, Maharashtra, Mysore, and Uttar Pradesh. Agreement has been reached between USAID and the Government of India on the organization and construction of these Indian cooperatives during the course of the year 1970. At the request of the Government of India, five NRECA technicians arrived in India in September 1969 for a two-year assignment.

In July 1969 the US Government approved a grant of Rs. 105 crores from PL-480 to the newly established Rural Electrification Corporation. Together with a sum of Rs. 45 crores made available by the Government of India, the grant will help finance a major acceleration in the spread of electric power.

The Fulbright programme, under which educational exchange is conducted, benefits Indian scholars travelling to the United States and American scholars coming to this country. More than 900 titles in agriculture, physics, chemistry, biology, and economics, for the use of Indian college students have been issued at heavily subsidised prices.

Indian Council of Agricultural Education

One of the programmes of the Indian Council of Agricultural Research with which the U.S. technicians were closely connected was the activities of the Indian Council of Agricultural Education. The first meeting of the Indian Council of Agricultural Education was held in Lucknow in August 1956. In the meeting, need was expressed for a seminar or conference designed to improve teaching in agricultural and veterinary colleges in India. At a planning session held in Bangalore in February 1957, an organising committee was formed. The seminar was held in Trivandrum for the southern half of India from May 14 to May 18, 1957 when discussion centered round six topics: Purposes and methods of teaching; Teaching aids; Tests and examinations; Students' field studies and tours; Student-teacher relationship and Teacher evaluation. The participants were divided into six working groups, each to work on one of these topics. The final sessions were devoted to open discussion of the recommendations of the working groups. This was a very successful seminar.

Somewhat similar seminars were later held in the individual institutions in Madras, Kerala and Mysore States with the cooperation of USAID/Tennessee team members. In these, attention was also focussed to consider ways of implementing the recommendations of the Trivandrum seminar. All these helped a great deal in making teachers understand their responsibilities and duties in the right perspective.

In addition to several such seminars held in different parts of the country, Regional Advisory Committee meetings were held once or twice a year under the auspices of the Indian Council of Agricultural Education.

Participating American universities may well ask, "To what ends do we foster this fraternal relationship between two universities on opposite sides of the globe?" President James A. McCain of Kansas State University answered it with these words of great import: "To ends as varied as the worthy activities in which men everywhere engage in meeting human needs for food, clothing, and shelter, the prevention and cure of diseases, the education of the youth, the security of old age, to ends as

lofty and compelling as the nourishment of the human spirit, the preservation of peace and the Universal Brotherhood of Man".*

Aid from Rockefeller Foundation

The Rockefeller Foundation's Indian Agricultural Programme came into legal being in April 1956 when a Memorandum of Understanding was signed by the Government of India and The Rockefeller Foundation. This agreement provided for cooperative efforts in developing a post-graduate school in agriculture at the Indian Agricultural Research Institute, (IARI) New Delhi, and for cereal improvement research with particular emphasis on hybrid corn, sorghum and millets, and subsequently extended to include wheat and rice. As a result of the progress in the cereal improvement programmes, the Foundation became involved in seed production activities, primarily through the National Seeds Corporation and more recently the new Division of Seed Technology at the IARI.

Under this Memorandum of Understanding the two principal phases of programme—research and postgraduate training—have been conducted in close inter-relationship. The Government of India and the Foundation have specific responsibilities in all of this cooperative work. The Government of India on its part arranges for the necessary land and facilities and the budget for local staff and for recurring costs of the programme.

The Foundation assigns to the programme permanent staff members, who are specialists in agricultural research and education and appropriates funds for certain items of scientific equipment and library books. There are now 11 permanent Foundation Staff members assigned to this programme, who are residents in India. In addition, a limited number of well known scientists from the USA serve as temporary staff members in the capacity of visiting professors with the Post-Graduate school and as consultants in the crop improvement work. Further, a number of temporary appointments are filled by young men on one or two-year post-doctoral assignments. An important aspect of the Foundation's contribution is the in-service training provided by having a limited number of young Indian scientists directly

* James A. McCain, A Fraternal Message from Kansas State University at the Andhra Pradesh Agricultural University Convocation, January 28, 1967.

associated with the staff members of the Foundation through temporary appointments.

In addition to the cost for providing the services of its staff members resident in India, the Foundation has appropriated annually sums of the order of \$200,000 to \$400,000 for equipment and other expenses in direct support of the field operating programme. The Foundation has also made grants to selected agricultural institutions in various parts of India, and provides scholarships for a limited number of Indian scientists to pursue postgraduate and post-doctoral study and research in the USA each year.

Emphasis is being placed on training for scientific research and teaching, on development of leadership in agricultural sciences, and on strengthening and improvement of the institutions concerned.

Among the sizable grants made to Agricultural Universities in India is the one to Punjab Agricultural University to meet the cost of laboratory equipment, books and periodicals, as well as for development of architectural and structural plans for construction of the Home Science College. Another substantial grant was given to Uttar Pradesh Agricultural University for development of an agricultural experiment station at Pantnagar and for the construction of an International hostel.

The active leadership which the Foundation took to help completely reorganise agricultural education at the post-graduate level at the Indian Agricultural Research Institute, New Delhi, was an achievement which perhaps did far more than any other single act to convince the Central Government and top educationists in India of the need and value of a change in traditional teaching and examination methods. The Rockefeller Foundation's contributions to agricultural education through the work of the Cummings' Committee was, therefore, only a small part of its totality of assistance.

The Rockefeller Foundation also gave substantial aid and provided the leadership in the evolution of several crop hybrids with high yield potential and showed in a practical way the benefits of interdisciplinary research, such as hybrid maize, hybrid sorghum and other hybrid millets, all of which brought dramatic yield increases, which impressed the Governments and the public; and increased their faith in science and technology

for solving the food problem in India. These efforts in respect of some crops is described below.

MAIZE :

The coordinating headquarters of the Maize Improvement Project is located at the Indian Agricultural Research Institute, and research is conducted at 17 stations in the country representing different ecological zones. Breeding materials have been introduced from all maize growing areas of the world and evaluated for performance under Indian conditions. In 1961 four hybrids namely, Ganga 1, Ganga 101, Ranjit and Deccan, were released from this programme and put into production. Three additional hybrids were approved for release in 1963 and to date, a total of ten hybrids have been released. Additionally, six composite varieties were released to growers in 1967.

SORGHUM :

Under the Coordinated Sorghum Improvement Programme uniform varietal tests have been established in various parts of India and a systematic programme undertaken for selecting and proving the most productive and useful varieties for Indian use. The more promising ones are being crossed on to male sterile lines to produce hybrids with potential for higher yields and better performance under local conditions.

The hybrids CSH-1 and CSH-2 were approved for release in 1964 and 1965. These hybrids are, to a considerable extent, photo-period insensitive, and perform well from the Southern tip of the country to Punjab in North. Yields upto six tons per hectare have been obtained under good cultural practices. An improved variety "Swarna" has been released and showed much promise.

The estimated area under these high yielding sorghums in 1968-69 was 680,000 hectares. The shoot fly and stem borer are serious pests of sorghum and efforts are being made to identify and utilize sources of resistance from the world collection.

MILLETS :

Research activities of the All-India Coordinated Millets Improvement Project produced two hybrids which were released in

1965 and 1966 making use of male sterile seed parents developed by Dr. Glenn Burton at the USDA Station in Tifton, Georgia. Since then additional hybrids have been developed and released. Although traditionally *bajra* is grown in low rainfall areas and under relatively low levels of management, the new hybrids bred to receive more prominent attention. Under good cultural practices yields of 3-5 tons of grain per hectare have been obtained. Approximately 736,000 hectares were seeded with hybrid *bajra* in 1968-69.

WHEAT :

The Coordinated Wheat Improvement Programme, begun in 1961 and revamped in 1964, made use of this introduced germ-plasm in its breeding program. Six varieties were released-Kalyansona, PV 18, Sonalika, S 331, Sefed Lerma and Sharbati Sonara.

The breeding programme has greatly expanded and large numbers of Indo-Mexican crosses have been made and are in different stages of advance. Yields of 5-7 tons per hectare, and occasionally more, have been achieved by several farmers. Correspondingly work on Agronomy, Plant Pathology, Physiology and Entomology has increased. Agronomy has, in particular, kept pace with new developments side by side with breeding.

RICE :

The All-India Coordinated Rice Improvement Project (AICRIP), with headquarters at Hyderabad, has mounted a country-wide programme to identify, develop and evaluate improved varieties making use of the recently introduced materials. Already, yields of upto 10 tons per hectare of paddy have been obtained on experimental plots and in some farmers' fields. Yields in cultivators' fields of 6-7 tons per hectare are fairly common.

The performance of the introduced Taichung (Native) 1, and Tainan 3 from Taiwan, and I.R. 8 from CRR I has been particularly outstanding. However, these varieties have certain limitations such as susceptibility to bacterial leaf blight (especially Taichung Native 1), and a poor acceptance by consumers. In 1968, Jaya and Padma, the first varieties from AICRIP were released.

Both resulted from a cross between Taichung-N-1 and T 141 variety from Cuttack (Orissa). Jaya yields 10% more than IR-8 and is about one week earlier than Taichung Native 1, superior grain quality than IR-8 retaining a high yield potential.

Associated intimately with the development of the maize hybrids in 1961 was the recognition that inadequate provision existed to rapidly capitalize on those hybrids. There was a lack of organization, personnel and resources to permit and promote production of quality seed to meet the expanding scale of anticipated needs.

In response to this situation the National Seeds Corporation was formed in 1963.

An Indian Seed Review Team in 1967-68 helped to outline guidelines for the future development of the seed industry. Many of these points are currently being implemented. A Seeds Act and its Rules came into force across the country on October 1, 1969. Implementation provides for minimum limits of germination and purity plus truthful labelling of seeds sold commercially. In addition a legal base is provided for a voluntary seeds certification programme. The seed certification work is being shifted from National Seeds Corporation to official agencies.

Over 800 persons have participated in more than 30 training programmes of 3-7 weeks duration. Assistance has been given in numerous ways to these seed production, processing, certification, testing and law enforcement programmes.

A Seed Technology Division is being formed at IARI for offering M Sc. and Ph. D. degrees. UPAU is planning to initiate a B-Sc. programme in Seed Technology.

Recently a decision was taken to intensify the work on grain quality. A laboratory has been established at the Indian Agricultural Research Institute which is equipped to determine the quantity and quality of protein in grain. Through identification of promising materials that have a high level of protein and favourable amino acid balance, it is anticipated that breeding procedures will be modified to permit incorporation of these quality factors into the high-yielding varieties and hybrids.

ASSISTANCE PROVIDED BY THE ROCKEFELLER FOUNDATION
TO AGRICULTURAL UNIVERSITIES IN INDIA 1956-1969

Indian Agricultural Research Institute, New Delhi

Fellowships and Scholarships (1 to 3 years)	.. 19
Travel Grants (Less than 12 months)	.. 26
Extension of Library Building and air-conditioning	.. \$ 145,000.00
Laboratory for Grain Research	.. \$ 77,000.00
Post-Graduate Programme (Scientific and supplies Equipment including chemicals)	.. \$ 570,230.00
Cereal Improvement Programme (Agricultural Equipment)	.. \$ 336,910.00
<i>Agricultural Reference Books</i>	.. \$ 32,330.00
Technical Experts {Long Term	.. 20
{Short Term	.. 42

Jawaharlal Nehru Krishi Viswavidyala, Jabalpur

Fellowships and Scholarships (1 to 3 years)	.. 6
Travel grants (less than 12 months)	.. 3

*Orissa University of Agricultural Sciences and
Technology, Bhubaneswar*

Fellowships and Scholarships (1 to 3 years)	.. 2
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Punjab Agricultural University, Ludhiana

Fellowships and Scholarships (1 to 3 years)	.. 10
Travel Grants (less than 12 months)	.. 6
Experiment Station Development	.. \$ 320,000.00
Development of Architectural and Structural Plans for Home Science College	.. \$ 15,000.00
Cereal Improvement Programmes (Agricultural Equipment)	.. \$ 10,320.00

University of Agricultural Sciences, Bangalore

Fellowships and Scholarships (1 to 3 years)	.. 1
Travel Grants (less than 12 months)	.. 2
Cereal Improvement Programmes	.. \$ 1,080.00

Uttar Pradesh Agricultural University, Pantnagar.

Fellowships and Scholarships (1 to 3 years).	.. 8
Travel Grants (less than 12 months)	.. 5
Development of Experimental Station	.. \$ 240,000.00
Construction of International Hostel	.. \$ 20,000.00
Cereal Improvement Programmes (Agri. Equipment)	.. \$ 230,860.00

The Ford Foundation's Contribution

From the beginning of India's first Five-Year Plan in 1951 the Ford Foundation has helped the nation explore new approaches to age-old problems and find new ways of developing its economy and its society. This assistance arises from the character of the Foundation as a private, non-profit, philanthropic institution, dedicated to the advancement of human welfare. In keeping with this philosophy, Foundation aid to India is directed towards helping the nation launch basic development activities which strengthen the economic and social welfare of the Indian people. This assistance is tailored to fit the needs of each individual project or programme. In some cases Foundation grant funds are contributed, on a matching basis, to an equal amount of Indian funds and the total covers recurring costs for the first two to five years. Grant funds are always given on the assurance that Indian resources will be available to cover full operating costs if the programme officers promise of solving the problem and meeting the needs it was designed to serve.

Foundation assistance includes the services of consultants who are specialists in such subjects as fertilizers, soils and family planning. Their job is to help their Indian colleagues get to the roots of stubborn national growth problems and map out solutions for them. Financial assistance is given for a limited amount of equipment which is not available in India. The Foundation also provides foreign training for a limited number of Indian officials and staff members who are directly connected with Foundation-assisted Indian development projects. Virtually all the Indian projects aided are selected on the basis of their potential for becoming permanent, built-in features of India's

overall development programme which is blue-printed in the current series of Five-Year Plans.

As elsewhere in the world, the Foundation's aim is to help India move forward in a creative self-sufficient way. The emphasis is on self-generating Indian development activities, which nourish national economic and social growth. In allocating grants, close attention is paid to the priorities of projects in these terms. All grants involve new approaches to persistent, often age-old problems, and education and training to help meet the requirements of India's developing society.

IADP Package Programme

A team of Ford Foundation specialists surveyed in 1959 India's food situation and reported that an immediate and drastic increase in food production is India's primary problem* of the next seven years. Since late 1960 the Foundation has been providing assistance to India to increase her food production and Foundation-supported programmes are opening the gates to the additional over-all production that is required.**

The Intensive Agricultural District Programme (IADP)—Package programme begun in 1961-62 with the Foundation's support is designed to demonstrate how Indian farmers can use a combination of modern agricultural technology to increase their production and incomes thereby adding to national food supplies and at the same time enabling wider improvement in rural living conditions.

Modern Storage and Milling of Rice

The Ford Foundation has assisted the IADP project through training and research in paddy storage and rice processing. The old method of sun drying results in losses of 10% under adverse conditions and further causes cracks in the grain which results in breakage during milling. This old method is replaced with modern mechanical paddy driers of threshed paddy to reduce its moisture content to 14% before being moved to the mills. Modern rice mills in which maximum yield of rice from paddy

* "India's Food crisis and steps to meet it".

A team of Ford Foundation specialists and Government of India officials (1959).

** Dr. Douglas Ensminger—Programme letter 134, July 10, 1964

can be obtained are efficient by 3-4% extra recovery over the traditional huller rice mills. With installation of modern silo storage units the losses due to handling, rodent damage to gunny bags piled in huts are reduced by 9.3%. The modern silo units are provided with facilities for aeration and fumigation.

The experiences gained by the operation of the first six modern rice storage units in India, have provided much information needed for the expansion of the industry. The new paddy processing units are eliminating losses due to sun drying, reducing losses during storage, and providing higher yields and higher quality rice from the farmer's paddy. We should not overlook the impact on other industries in India. At present, 11 major manufacturing industries are fabricating driers, silos, conveying equipment, and cleaners. Three leading companies have begun the manufacture of the modern rice milling machinery, with the assistance of foreign firms who previously manufactured this equipment. Engineering and management training programmes have been organised to train the key people for further expansion of this new enterprise.*

Grants for Institutions and Universities

To strengthen India's capacity to achieve a long term solution to her needs for better agricultural engineering services, including attention to irrigation and drainage, it is found necessary to strengthen programmes to educate and train agricultural engineers particularly applied irrigation and drainage. Lack of technical production skills in these three areas help keep Indian Agricultural production far below its potential. The Ford Foundation has, therefore, supported the development and production of prototype agricultural implements, another important need of Indian Agriculture. A grant has been made to help the Indian Institute of Technology at Kharagpur to strengthen a Ph. D. Programme in agricultural engineering for the long-run advancement of engineering as applied to agriculture. Another grant was made to Punjab Agricultural University, Ludhiana, through the Ohio State University in July 1964 to make rapid progress in supplying agricultural engineers for

* Wimberly, J.E. (1969)—Modernizing rice handling in India, Span 12: (2) 121-23.

practical work, particularly in irrigation, drainage, implements and power design.

To promote the development of a strong department of agricultural economics with a programme of research, teaching and extension oriented and responsive to the needs of India's Intensive Agricultural District Programme (IADP) and to other problems arising from the transition from traditional to modern agricultural practices, the Ford Foundation sanctioned a grant to Uttar Pradesh Agricultural University on June 10, 1963.

Water Technology Centre (IARI)

A more recent substantial grant has been towards the establishment and operation of a Water Technology Centre (WTC) to be located at IARI New Delhi to deal with water related problems on an All-India basis. The objectives include: (a) offering instruction, at several levels, in water science, engineering and related subjects for personnel urgently needed to fill important teaching, research, and extension posts at Agricultural Universities, research stations of both center and State governments, operations agencies, and others, (b) working through programmes, including All-India Coordinated Schemes, (c) provision for assistance in strengthening teaching, research and extensions activities involving Water Technology at the Agricultural Universities and other Institutions.

Yet another grant made by the Ford Foundation was to the University of Agricultural Sciences in Bangalore on January 26, 1966, to help the University strengthen and co-ordinate teaching, research and extension work in all disciplines involved in the field of plant protection. Plant Protection is as important to the farmer as the use of chemical fertilizers and improved seeds; and with the increased crop yields from the use of the latter, the necessity of effective plant protection becomes greater. So central is plant protection to food production that it has been stated that if it were possible to wipe out all pests and plant diseases in a single effort, this alone would erase India's food shortages and push food production well beyond present Plan targets. These three massive grants have been of real help to strengthen the three universities to serve Indian agriculture efficiently and effectively.

THE FORD FOUNDATION PROGRAMME ASSISTANCE TO INDIAN AGRICULTURE AND
AGRICULTURAL UNIVERSITIES 1951-1969

Serial Number	University/Institution	Programme Assisted	Value in Dollars
1.	UP Agricultural University	i. To establish a Farm management training and research centre ii. To establish India's first Agricultural Communication Centre For development of teaching and research in Agricultural Engineering To develop an integrated programme of plant protection teaching, research and extension activities	4,74,450 1,20,500 6,42,000
2.	Punjab Agricultural University		6,50,500
3.	University of Agricultural Sciences, Bangalore		
4.	IARI New Delhi	i. Finance one half of the construction costs of a building for class rooms and laboratories for the division of Agricultural Economics and Extension Education ii. Electronic Data Processing Equipment	77,114 378,236
5.	Allahabad Agricultural Institute	I. To support a programme of home science Extension at the B.Sc. level.	51,215

6. Ministry of Food and Agriculture, Food production programme IADP	ii. To cover the cost of establishment and operation of Agricultural implements design and development centre	9,65,115
	iii. Towards expansion of a programme of Extension education and training	9,39,950
	i. Intensive Agricultural District Programme directed towards increased food production.	125,90,000
	ii. Training and research in paddy storage and rice processing	3,45,000
	iii. For 15 pilot Extension projects under community development	8,73,876
7. Indian Institute of Technology, Khargpur	iv. For publication of journal 'Sons of the Soil'	23,906
	v. Indian Farm youth Exchange	4,83,578
	For development of teaching and research in Agricultural Engineering	5,17,000
8. MS University of Baroda	To Support a programme of post-graduate training and research in Home Science .	17,09,000
	To support research in reproductive biology	3,06,000
9. Institute of Agriculture, Anand (Gujarat)		

Modern Communication Centre at UPAU

The Ford Foundation has approved a grant of \$120,500 to the Uttar Pradesh Agricalural University to support the establishment of India's first Agricultural Communication Centre. India's first modern agricultural university will thus also be the first to emphasise an integrated programme of resident instruction, research and service in modern agricultural communication. Approved by the Ministry of Food and Agriculture and the Indian Council of Agricultural Research, the UPAU plan calls for early establishment of credit courses in agricultural journalism, audio-visual methods and use of radio and television.

The Ford Fundation grant provides for the purchase of a variety of modern audio-visual, press and radio recording equipment not available in India. The University library will be supplemented by books, journals and periodicals in the field of communication. Travel and observation tours will be provided to selected UPAU staff to enable them to become familiar with agricultural information programmes in other countries. The University of Illinois which is assisting in the general development of UPAU will provide the short-term consultants in specialised phases of the Centre's operation.

The long term plan for the development of the Agricultural Communication Centre includes three stages beginning with the drawing together of existing activities and staff during 1970. Stage two will see the initiation of under-graduate courses and in-service training programme. Stage three, expected to begin between 1972 and 1974, will include post-graduate training in agricultural communications aimed at providing specialized personnel for mass media, universities, government agencies and *agro-industries*.

10. Agricultural Universities

IN a letter of August 22, 1961, to the State Governments, the Government of India mentioned the origin of the new concepts in education, research and extension in agricultural sciences in so far as they relate to the establishment of agricultural universities in India. The relevant portions of the letter read as follows :

"The establishment of Rural (Agricultural) University was originally suggested by the University Education Commission . . . which visualised a Rural University as a 'Ring of small, resident under-graduate Colleges which specialised and University facilities in the centre'. The First Joint Indo-American Team . . . in 1965 further clarified this recommendation and made practical suggestions for its implementation. The Team recommended as a first step, setting up of a nucleus comprising a College of Agriculture, and a College of Veterinary Science to which, in due course, could be added a College of Home Science and a College of Agricultural Engineering and Technology".

The development of Agricultural Universities could not, however, be expected to proceed on any rigid pattern. Subject to the administrative policies and procedures prevailing in each State, the development has necessarily to be on dissimilar lines, even though the goals remain the same. In fact, no two agricultural Universities in India were conceived, established or operated on a standardised pattern. Such a dissimilarity is indeed an advantage, so long as the basic concept, philosophy and objectives are not compromised, for the diverse experiences gained by the adoption of different approaches and procedures could convey valuable lessons to the future.

In the following accounts of each of the agricultural universities established in the country to date, the salient features of each are highlighted with the hope that in planning new universi-

ties of this type in the remaining States of India, the experiences already gained would provide useful guidelines.

The Indian Agricultural Research Institute, New Delhi

Deemed to be an Agricultural University but deserving to be acclaimed as the National University of Agricultural Sciences, the Indian Agricultural Research Institute has shone as the luminous star in the educational and scientific firmament of India for the past few decades. It is located about five miles West of New Delhi Railway station on a self-contained 620 hectare campus of its own. Originally devoted to research, the IARI soon developed to become also the premier post-graduate educational centre in the field of agricultural sciences.

The institute was originally established by the Government of India in 1905 at a village called Pusa in North Bihar under the name Imperial Agricultural Research Institute. Lord Curzon the then Viceroy and Governor General of India to whose initiative and efforts the Pusa Institute owed its origin while laying the foundation stone of the Imperial Agricultural Research Institute said :

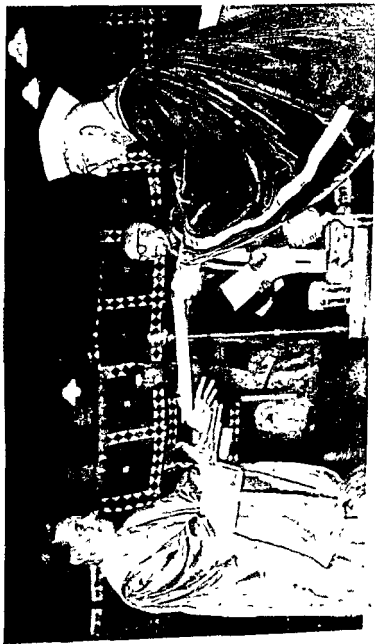
“Should I find Pusa the centre of a great organisation, with ramifications extending to all parts of the Indian continent, training a series of students, who will devote their acquired knowledge to the practical pursuit of agriculture and able to point to the tangible results of successful scientific experiment both in the quality of seeds and plants, in the destruction of pests and in the improvement of breeds of cattle ? That is the prospect that I should like to look forward to, and if it be at all realised, then we may be assisting at a rather momentous child birth today”. There can be hardly any doubt to-day that noble Lords’ wishes have been fully materialised over the years.

The unfortunate Bihar earthquake of 1934 damaged the Agricultural Research Institute at Pusa (Bihar) beyond repair and the Government of India decided to rebuild the institute on a site within the environs of Delhi. By November 1936, the transfer to Delhi at the newly constructed buildings was almost complete. On November 7, 1936 Marquess of Linlithgow, the then Viceroy opened the Central Library building of the institute. In declaring the New Institute open, he said :

“The Institute has in it, I am confident, the power for fur-



Mrs. Indira Gandhi, Prime Minister of India at a convocation of IARI, congratulates a young lady as the recipient of a doctoral diploma



The first recipient of a doctoral diploma at a convocation of IARI, from Mr Moraji Desai, Finance Minister, Government of India, is A Sankaram (the junior author)

ther service of infinite value to India ; alike to the Provinces and to the Indian States. Its tradition and its reputation are those of established distinction. It has been served by many able and distinguished men with a loyal and disinterested devotion throughout the many years of its existence. I am confident that the present staff will amply sustain the past record of the institution for scientific achievements of the highest standard. In today declaring open its new home I do so with the wish, which all of us share, that under its new auspices, its future may be even more brilliant and the service it renders to India even more distinguished than ever before".

The Library was designated as the Linlithgow Library and the Laboratory for Soil Science and Agricultural Chemistry as the Phipps Laboratory, after Mr. Henry Phipps, the American Philanthropist, who made a generous donation towards part of the cost of founding the original Institute at Pusa.

The new set up at Delhi, its layout, organisation and development during the formative years 1937-45 was under the direction of Dr. B. Viswanath, the then Director and Imperial Agricultural Chemist. The earlier foundations were broad based and strong enough for the heavy super structure and significant expansion of the Institute that followed during the years 1946 to 1965. From 1950 to 1965 the history of the Institute was shaped by Dr. B.P. Pal, who later became the Director-General and Vice-President of the ICAR. Dr. M.S. Swaminathan, a radiation geneticist of international reputation currently presides over the activities of this institute.

Since inception, the Institute has flourished as a recognised centre for imparting post-graduate training to officers of the State Departments of Agriculture in India as also to other candidates drawn from within and outside the country so as to equip them for manning superior posts in the fields of research, teaching and extension. In 1932 the training programme was placed on an organised basis and two-year courses of specialised post-graduate training leading to the Diploma of Associateship of the Institute (Assoc. I.A.R.I) were offered in the major fields of Agronomy, Botany, Agricultural Chemistry, Entomology and Plant Pathology. By the end of the year 1958 more than 850 candidates received their diplomas. The diploma courses were discontinued in 1958 when the Institute through an Act of UGC-

cereals and millets. The amino acid analyser is a recent acquisition. The National Pusa insect collection in the division of Entomology is a rich and dependable source to workers in systematic entomology. The Mycological herbarium (*Cryptogamae Indias Orientalis*) developed over years and the Indian Type culture collection of fungi, bacteria and viruses in the division of Mycology and Plant Pathology—judged by any standards can be listed among the best.

The radio tracer unit of the division of soil science is engaged in research on phosphorus nutrition of economic crops employing (P-32) radio-isotope as tracer. With the support of UN special fund nuclear research laboratories are being established where nuclear tools for improvement of crops both in quality and quantity are being worked out. Apart from modern electronic instruments for the work in division of agricultural physics the electron microscope is an addition of significant value to fundamental work. The All-India Soil and Land-use Survey has cartographic assembly for preparing soil survey maps. The divisions of Botany and Horticulture with the cooperation of the division of plant Introduction have in recent years developed extensive world collections of varieties and related species of several economic crops, chiefly wheat, maize, millets, linseed, cotton and of vegetable crops, fruit trees and ornamental flowers (roses and chrysanthemums). In the division of Agronomy a herd of milch cows of the Sahiwal breed has been developed through breeding, selection and improved management practices carried out during the last 58 years. This breed has been recognised by experts as being one of the best and most consistent performing herds.

A magnificent transformation of the entire available land for experimental purposes at the institute is underway with the generous assistance of the Rockefeller Foundation. The aim is to introduce high standards of farm management, optimum utilisation of land and efficient methods of irrigation. To this end a division of farm operations and managements (DFOM) has been created whose work is centered on effecting an integrated irrigation and drainage system for the entire area.

Since 1950, the Institute has carried out some useful work in a group of villages in Delhi State. Currently the work covers about 60 villages of the Kanijhawala Block and the

adjoining areas. This effort, in which all the Divisions of the Institute participate, is spearheaded by the Division of Agricultural Extension which, in addition, also conducts researches in agricultural extension methods and techniques from the basic standpoint. The division of Agricultural Economics is engaged on useful agro-economic surveys and on the economic evaluation of the extension work.

The types of services and extension advice given to the farmers cover a wide range and runs into a very long list of items. Essentially, the supply of pure seed and planting material of improved varieties of crop plants vegetables and fruits is the most dominant work. The soil testing service for better fertiliser use and crop protection measures to control pests and diseases is next in demand and has been carried out on an impressive scale. Among others equally rewarding and popular has been the cow-dung gas plant for production of fuel gas for domestic use lighting and cooking without in any way losing the manurial value of the dung. All in all, the impact of the extension services on the farmers is a willing change from archaic methods to modern agriculture.

The IARI in having its location at the seat of the Central Government offers opportunities to eliminate administrative delays through personal touch and dialogue. All the Foundations and foreign institutions which have offered generous aid for development are also located in close proximity.

Most of the foreign dignitaries, including statesmen, scientists or administrators, have been eager to visit this Institute, and have their appreciation and encouragement to the teachers and scientists.

Uttar Pradesh Agricultural University, Pantnagar
(Proposed to be renamed as Pant University of Agriculture
and Technology)

Located in Nainital District on an area of about 16,000 acres which comprised the Tarai State Farm of the Uttar Pradesh Government, this University has the distinction of possessing the largest farm operated by a single institution. Originally, this area formed part of a thick, impenetrable jungle, noted for wild animals. Soon after India won its independence, the Government of India decided to clear and

reclaim this area for colonising the refugees from Pakistan, the veterans of World War II, the political sufferers of the freedom struggle and the landless labourers of the State. Dean Hannah has shown how the operation was organised on a war basis against malignant malaria, inhospitable jungle and the wild animals in Tarai.* Referring to this Mr. C. Subramaniam, former Central Minister for Food, Agriculture, Community Development and Cooperation, has said that the story of the development of the Tarai Farm is an epic of man's conquest of untamed nature and that the Tarai Farm is a monument to the spirit of adventure in man, his never-ending battle against the vagaries of nature, and it is a beacon light to the farming community in the country.**

The University of Illinois entered into a contract with AID in October 1959 to assist the Uttar Pradesh Government in setting up a University in the State. Earlier, Dean Hannah came to India in 1955 and spent two years in developing a "Blue-Print for an Agricultural University". His report and recommendations were accepted as the basis for the development of the University and the U.P. Government set up a "Development Committee" to prepare plans and estimates. This Committee had the State Chief Secretary as Chairman and the members included the Secretary to the U.P. Department of Agriculture, who latter became the first Vice-Chancellor; one representative each of USAID and the Rockefeller Foundation. A small sub-committee was designated to visit the US to study the Land-Grant Universities and bring back suggestions.* Two members of this Sub-committee were Mr. K.A.P. Stevenson and Dr. Y.R. Mehta and their report has been published under the title, *The U.P. Agricultural University—A New Type of University in India*.† The third member prepared plans for the campus, following many of the plans prepared earlier by Dean Hannah.

The U.P. Agricultural University Act (U.P. Act XLV of

* Hanna, H.W. (1957) the State Farm, Tarai. Its progress and possibilities as a rural university in India. U.P. Agricultural University.

** Annual Convocation of U.P. Agricultural University 1966. Ministry of Food and Agriculture, New Delhi.
Ibid. P. 54.

† These are persons trained in institutions below the college level for performing extension duties at village level.

1958) was passed by the State Legislature on December 20, 1958, and received the assent of the Governor on December 25, 1958. It provided for the establishment of the University on the Tarai State Farm, but did not include provisions for transferring research and extension activities in UP to the University. Nor were the many other institutions, devoted to higher education in agricultural sciences in UP, brought under the coordinating authority of the Agricultural University. In effect the University has remained to date as just one among the scores of institutions in UP and thus has been deprived of direct relationship or association with other agricultural and veterinary colleges and research stations in the State. But one far-reaching decision taken by this University was to assign teaching and research activities in Animal Husbandry to the College of Agriculture instead of to the Veterinary College as was the erstwhile practice in India.

Mr. K.A.P. Stevenson was named the first Vice-Chancellor for a four-year term, while the Board of Management elected Mr. Ajit Prasad Jain as Chairman for four years.

The statutes were soon prepared but, due to some error, these were approved by the State Government only in March 1961. The first registration of the University, however, was held on July 9, 1960, and class work began on July 11 with an enrolment of 246 students (145 in College of Agriculture and 101 in College of Veterinary Science). Both the staff and students had to live and work under trying circumstances for want of adequate housing and other facilities. The University was later dedicated on November 17, 1960, to late Pandit Jawaharlal Nehru, then Prime Minister of India.

The first Vice-Chancellor vacated the office on the completion of his term. In about an year, the Board Chairmanship also changed hands. Personal rivalries and inadequate understanding of the needs of the institution created a difficult situation. Ultimately things came to a head, and on January 17, 1966 the Governor of the State in his capacity as the Chancellor of the University issued an ordinance on advice from the State Government terminating the services of all members of the Board and the Vice-Chancellor. A fresh start was made with the third Vice-Chancellor.

The University as it stands today has four full fledged

colleges viz. (i) College of Agriculture (ii) College of Veterinary Science (iii) College of Basic Sciences and Humanities and (iv) Pant College of Engineering and Technology. A college of Home Science is being developed and is likely to function by July 1971.

A unique feature of this University is the development of a strong basic sciences college in which Biological, Chemical and Physical sciences related to agriculture and veterinary have been well organised both for teaching and research at under-graduate and post-graduate level. For this purpose, Biological Sciences include, Microbiology, Genetics, Zoology, Nematology, and Botany. Biochemistry, Plant products Radio-tracer methodology, Organic, Physical and Analytical Chemistry come under Chemical Sciences. Included in Physical Sciences are Mathematics, Statistics, Physics and Geology. Under Agriculture and Veterinary sciences M. Sc. programme is being offered in 24 disciplines and Ph. D. in 9 areas. The College of Technology offers postgraduate courses leading to the award of M. Tech. in four subjects. Total graduate enrolment for post-graduate studies is 350 and 1200 for under-graduate courses.

Undergraduate students are required to conduct work projects as credit courses. Groups of students are permitted to grow crops or tend livestock. They must do the planning and all the work. Income in excess of operational costs is divided among the individuals in the group. This is termed as "learn while you work project". It provides a practical application of newly acquired technical knowledge, gives the student confidence and demonstrates that there is dignity in work. The engineering students are required to develop a working model or machine through what is termed a "dirty hands" project. A part of the success in UPAU graduates finding employment on farms, in banks, services and supply companies and cooperative business, is attributed to the emphasis given to the "earn while you learn" programme. Only a few other Agricultural Universities have this type of practical approach to learning, though in slightly varying forms.

Since this is the only one of the agricultural universities to have been started as a completely new institution all the components of the campus had to be built. The college

buildings are well-equipped with all modern scientific equipment and gadgetry so as to facilitate adaptive research work.

Campus development programme though slow at the outset, received a vigorous drive later, with the result that today there are five major academic buildings, seven hostels, several residential quarters, schools, and auditorium. An excellent library centrally located caters to the needs of all the colleges. It functions 14 hours per day practically all through the year. Students and staff have unrestricted access to books and periodicals arranged systematically in open shelves. Books are circulated for home reading. An additional building is contemplated in its expansion programme. Those under active construction and nearing completion are the Home Science college building, hospital, shopping centre and a guest house. The entire estate has a dependable water supply and electric current.

Every department of the University without exception, has an active programme of research besides teaching, both at under-graduate and post-graduate levels. As many as 319 research projects are in operation, besides 22 ICAR projects, 17 PL-480 schemes and 11 schemes involving the State Council of Scientific and Industrial Research. The projects financed by the Rockefeller Foundation and Department of Atomic energy substantially add to the research programme. A survey of the research work would therefore be quite lengthy and hence only few of the more important ones are mentioned below as examples.

In July 1964 operation of the International Maize Centre was undertaken as part of the experiment station activities in collaboration with the Rockefeller Foundation. The UPAU, one of the main centres in the All-India Maize programme, serves in addition as regional headquarters for the Inter-Asian programme activities in Pakistan, Nepal and Afghanistan. Since 1960, plant breeders in India have produced 10 successful new hybrids designed to meet the different needs of the major maize growing areas of the country. Dr. V.L. Asnani, Maize breeder at Pantnagar has brought out a white selection No. 3737 that so far outyields by 50% the best hybrids currently grown in U.P.

Experimental work has shown that a successful maize crop

may be grown from February to May in addition to the main kharif season. Production of 100 quintals of food grain per hectare per year was made possible in a hybrid maize-potato-hybrid maize rotation. Some varieties of sugar beet-USH-2 ; 647 ; Bush-F and Triplez registered high yields when sown between October 10th to 25th.

A research sub-station is being developed at Mornaula at an elevation of 7,500 ft. to facilitate the development of improved wheats for the plains and winter wheats for the hills. Of the varieties of soyabean, Brag and Clark-63 were found to be very popular with the farmers. The first report on the control of *Sclerotium* rot through the use of systemic fungicides 'Vitavax' and 'Demosan' emerged out of laboratory and field investigations at this University.

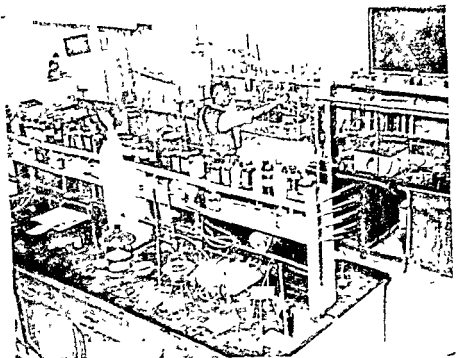
Research in microbiology is confined to field trials to test the relative efficiency of *Rhizobium japonicum* strains on soyabean. In the department of chemical sciences ten research projects and 19 experiments are in progress. Of these, one relates to a study of the changes in the unsaturated fatty acid constituents of seeds on germination. Active constituents from a number of medicinally important plants have been isolated and studied to elucidate their structures and examine their pharmacological activity.

The University has to its credit a livestock research centre at Nagla, where a fodder research centre has also been initiated in which production of fodder seeds constitutes a vital part of the programme. At the hill station Mornaula, research work is in progress on goats, sheep, cattle and poultry.

In the field of animal sciences, there are currently 11 projects with 28 experiments. One of these relates to development of new techniques in artificial insemination by producing semen in frozen state.

The seed industry developed at UPAU is one of the most significant contributions to practical agriculture and service to farmers. With new varieties and especially hybrids becoming available the urgency for the development of the seed industry became apparent. An achievement of considerable pride is the Tarai Development Corporation with 40% shares for the University, 40% for about 1,000 farmers of the State, and the balance 20% given to National Seeds Corporation. The ultimate





Well equipped research labs of the college of Basic Sciences and Humanities at UPAU, Pant Nagar



Studies in animal nutrition are in active progress at UPAU, Pant Nagar

object is to supply nearly 20% of seed requirements of India for the major crops—wheat, rice, maize, bajra. Four seed processing plants to work in shifts have been established and several staff members after getting trained in US on the seed processing techniques are now engaged in this work.

The spectacular progress of this university may be attributed to certain special advantages it enjoyed over others. This is not to minimise in any way the inclement weather it faced for some time at the outset, *although luckily it stood the test very well.* This was the first agricultural university that was started and developed entirely as a new project without in any way superimposing the assets or liabilities of a complex staff pattern of the existing Government departments of Agriculture and Veterinary science. This facilitated the creation of desirable faculty membership in a manner suited to achieve its objectives. By all counts this advantage has been responsible, *very largely,* for the success of this university. Secondly, the highly competent USAID staff worked for it, to serve as a model for others and in a way it was a prestige issue to the organisers. Thus, the Illinois team has assisted the University by locating about 25 staff members as advisers and consultants for varying periods of time; sent to the US universities, more than 50 persons from among the university staff as participants and supplied equipment of numerous types and books thus contributing valuable support at the difficult formative stage. A succession of Vice-Chancellors have laboured to tap all possible resources of assistance. It is one of the few universities which can claim to have drawn the maximum benefit from the USAID funds and also generous grants from the Rockefeller and Ford Foundations.

Dr. R.W. Jugenheimer of USAID under an assignment of adviser (research administration) made an intensive study and submitted a detailed report which outlines the existing organisation and suggested changes necessary for more effective research programme through defining clearly the functions of Deans, Directors, Joint Directors and departmental heads. He stressed the need for a desirable single line of command for leadership and communication.

The characteristic feature of this first university is that it does not enjoy State-wide jurisdiction. It necessarily therefore, has limited goals. The multiplicity of agricultural colleges in UP

numbering over 20 perhaps rendered it necessary to start the UPAU with a limited objective. But these very limitations have generated a number of problems, so that the opinion is growing for an amendment of the Act to confer State-wide jurisdiction at least in certain respects.

Notwithstanding all such initial difficulties this University has pioneered in many fields of activity to set a shining example to those who followed later in reforming the curricula and teaching methods, in introducing work experience to the students in a big way, and giving a practical bias to agricultural education, and more recently in focussing attention on commercial farm production in an unprecedented manner such as to strike the attention of farmers not only in the Tari, area but far beyond the region and the State. This university has therefore virtually set the pace for the other Indian Agricultural Universities in several directions. It would not be out of place to mention here of the nature of the offerings of the University in inviting applications for the different courses available at the University. In the true spirit of Land Grant College of US, the following special features were mentioned in the advertisement viz , (1) A residential university on Land Grant university pattern of USA offering integrated teaching, research and extension programmes with emphasis on practical training (2) student advisory system (3) Tutorials (4) placement service (5) 220 instructional days in an year (6) liberal financial assistance, including supply of text books at half price (7) assistantship for all post-graduate students except those securing outside fellowships (8) facilities for earning by part-time work while learning (9) most upto-date and sophisticated equipment (10) 12,000 acre farm and other facilities for practical training and (11) extensive extra-curricular activities.

Institutional growth towards maturity is more than apparent from the data given below. It can be said with certainty that a Land Grant College of the American ideology and philosophy for the benefit of the Indian farmers has been planted on the Indian soil at Pantnagar, radiating its faith throughout the length and breadth of the country.

Punjab Agricultural University, Ludhiana

This University came into existence in October 1962, although the actual implementation of positive measures to

improve the pattern of education, research and extension education were adopted after June, 1963.

This University had certain benefits which promoted its development speedily and on acceptable lines. With Sardar Pratap Singh Kairon as the Chief Minister, Punjab did a great deal to preserve intact the main features of the University as conceived by the Cummings Committee. He was also responsible for allocating initially Rs. 80 lakhs (8 million) for the Third plan period and later an additional sum of Rs. 1.75 crores (17.5 million) for the University. The Government of India responded with a commitment of Rs. 25 lakhs (2.5 million), to support the grant of Rs. 80 lakhs (8 million) by the State Government during the Third Five Year Plan. The second noteworthy feature is the fact that its Board of Management had some men of eminence who evinced abiding interest in shaping the course with their mature advice and moral support. Above all, it had as its first Vice-Chancellor one of the ablest and most experienced administrators in Mr. P.N. Thapar, who had previously worked as the Secretary to the Government of India in Food and Agriculture Departments and was, therefore personally conversant with all the recommendations made by the First Joint Indo-American Team which he himself was responsible to set up. Under such favourable auspices, it was to be expected that the Rockefeller Foundation, the Ford Foundation, USAID and ARS Group in charge of PL-480 supported research, were all willing to assist this new University with both finance and technical expertise on a massive scale.

The Punjab Agricultural University Act was passed in October, 1961 and the first Statutes were made by the State Government. Mr P.N. Thapar became the Vice-Chancellor in March 1962 and functioned in that capacity upto June 1967, when sudden illness incapacitated this doyen of Agricultural University Vice-Chancellors. He, more than any other Indian, personally spearheaded the movement of Agricultural Universities and showed by single minded efforts and devotion that the salvation for Indian agriculture lies through integrated efforts in the fields of teaching research and extension. The role played by Mr. Thapar for the improvement of agriculture through institutional re-organisation is bound to be remembered with gratitude and appreciation.

In the first year itself, a grant-in-aid of Rs. 2,20,000 for University Administration and Rs. 2,041,172 for the implementation of the Research and Teaching Schemes of the Departments of Agriculture and Animal Husbandry transferred to the University, were placed at the disposal of the University upto the end of March 1964. In its second year (1963-64), this University got financial assistance from the Rockefeller Foundation to the extent of Rs 15 lakhs (1.5 million) in addition to about Rs. 10 lakhs commitment for designing the Home Science College.

The Punjab Government transferred to the University all the research activities of the Departments of Agriculture and Animal Husbandry and also assigned to the University a key role in the field of extension education. The University seized upon this opportunity to reorganize its departments and to integrate their working with the needs of the farming community.

Apart from the College of Agriculture at Ludhiana, (successor to the Government Agricultural College and Research Institute of Lyallpur, which was started in 1949 after a temporary stay in Amritsar following partition), the College of Agriculture at Hissar established in July 1962 and the College of Veterinary Science in Hissar, (successor to the Government Veterinary College of Lahore), new colleges were established after the formation of the University. These are, College of Agricultural Engineering started in Ludhiana in July 1965, College of Animal Sciences started at Hissar in 1966, and College of Home Science at Ludhiana in 1966. At the time of formation of the University, a very modest (M. Sc.) programme essentially through research was in existence. In 1964, the Post-graduate programme was commenced in an extensive manner offering M. Sc., in almost all the departments in Agriculture, Basic Sciences and Humanities, Animal Science, and Veterinary Medicine. The Ph D programme was started in 1964 in the fields of Agronomy, Bio Chemistry, Agricultural Economics, Genetics, Horticulture, Plant Breeding, Soils, Animal Breeding and Veterinary Surgery. Both Masters and Ph. D. Programmes included a certain amount of course work and a year or more devoted to independent research culminating in a thesis or dissertation. Subsequently, Ph. D. pro-

gramme was expanded to include all the other disciplines. Master's programme in Agricultural Engineering commenced in July, 1969 and that in Home Science was expected to commence in July 1970.

One more stride in the expansion programme was the opening of a College of Agriculture at Palampur in July, 1966; thus increasing the number of campuses to three, Palampur being in the hilly areas. From the very beginning the University was aware of the existence of three distinct regions and had plans to develop major activities in these three different regions to meet the needs of each region. Thus, the main campus at Ludhiana catered to the needs of the rich plains of the Punjab, the campus at Hissar to the needs of the drier regions of the State, and the new campus at Palampur for the hilly areas. The starting of a campus at Palampur did raise some complications in that a similar institution in hilly areas of the adjoining Himachal Pradesh existed at Solan. When the hilly area of Punjab was ceded to Himachal Pradesh, the small State has been left with two Agricultural Colleges.

Unfortunately, the splitting of erstwhile Punjab into Punjab and Haryana States with some portion going to Himachal Pradesh brought in certain complicated factors. Though the University developed three campuses with the intention of gradual delegation of authority and responsibility to the campuses to cater to the needs of the respective region, with of course a common policy direction from the University administration, the division of the State into three regions brought to the fore political effects and regional impatience leading to lack of confidence, particularly from Haryana. Although the ill effects of that were scotched temporarily by the decision to retain the University as one unit but with clear financial allotment to the different regions to ensure that funds provided by one State are not used for the benefit of another State, smooth functioning of the university was made difficult. The only alternative left was to divide the University as well. This was accomplished by the formation of the Haryana Agricultural University with effect from 1st February, 1970 with Hissar campus as the headquarters. For the time being, the Palampur campus is still with the Punjab Agricultural

University with a provision made for it to separate and join when a University is established in Himachal Pradesh.

The administrative and financial procedures followed for a time in this University were those inherited from the Government, known as the double file system. Since this resulted often in unnecessary delays and led to duplication of work, it was replaced in 1965-66 by a system which simplified procedures. The new procedure comprised of (i) introduction of single file system, (ii) delegation of powers to certain classes of officers, (iii) reduction of certain supervisory posts in the central office, and (iv) provision of such posts for the heads of departments. This system has considerably reduced delays but it has definitely added some administrative responsibility with the scientists, particularly the Heads of Departments. While in many departments with moderate establishment and financial provision, the Heads of Departments are not unduly taxed; in some departments, like Plant Breeding, with large establishment and heavy financial outlay and work spread throughout the State, this has meant heavy administrative duties to the Head of the Department. The University has weighed the merits and demerits of both the systems and has preferred one with less of centralization.

In spite of the ardent advocacy of the Land Grant concept, a certain amount of administrative hierarchy has been established in this University since it is essentially supported by State Government funds and has to follow, particularly in accounts, the State pattern. The University has continued to have an officer from the State deputed to be the Registrar. The University has found this useful since it is required to keep a constant liaison with State departments concerned. In the early stages, many administrative and accounts officers were obtained on deputation and as the University has progressed they were either reverted to the parent departments or absorbed into the University.

The Vice-Chancellor's office was established in Chandigarh about sixty miles away from Ludhiana. The presence of Vice-Chancellor in Chandigarh resulting in constant and easy touch with the State Government supporting the University and the administrative relationship of Mr. P.N. Thapar had a great deal to do with the vigorous growth of this University in its early

years. While normally, one would have anticipated that the absence of the Vice-Chancellor in the main campus may have a detrimental effect, the frequent visits of the Vice Chancellor to the main campus, easy telephone communications and daily couriers' moving papers between Vice-Chancellor's office and the campuses, allowed an effective functioning of the University. In a way, this was a benefit since the Vice Chancellor was not unnecessarily taxed by petty problems which could be handled locally by officers at different levels.

For the undergraduate programme, admissions are open to those with High School/Higher Secondary/Pre-Engineering/pre-Medical qualifications. The admission for Undergraduate Programme in Agriculture are made separately for Hissar, Ludhiana and Palampur, the students from the respective region admitted to the Agricultural College located in that region. This was done for the convenience of the students and to impart a training with a bias of the regional agro-climatic conditions since most graduates preferred to work nearer their home. After the establishment of the Colleges of Agriculture, in the three different regions, it was noticed that a greater number of students from the two new regions i.e., around Hissar and Palampur, had taken-up to farming as a profession. Where only one college existed for the University, like the College of Agricultural Engineering, College of Home Science, College of Animal Science and College of Veterinary Medicine, the reservation of seats for the different regions were made to ensure that no region suffered. There has also been a provision of admitting upto 10% of the students from outside the States concerned.

Because of the very favourable climate created, in the very beginning, by the transfer of all research in agriculture in the State to the jurisdiction of the University and giving responsibility for all extension training and education in the State, there has been a very healthy integration of teaching, research and extension. The chances for this were further improved by the administrative set-up in which the head of a department is the king-pin coordinating the three activities. He has the budget and establishment control on all the three activities in the disciplines he has. The Deans of Instruction, the Director of Research and the Director of Extension Education are

essentially technical coordinating officers. This has given the power and opportunity to a head of a department to regulate integration discipline-wise and also person-wise. A member of the staff primarily on research responsibility is given courses of his specialization to teach. Similarly, collaborative projects involving institution, research and extension members of the faculty are initiated. The members of the staff primarily involved in instruction, research and extension, are all located together near their laboratories enabling constant collaboration.

The research output of this University has been of a high order. Till bifurcation, there were 20 research stations including one nucleus seed production farm. These 20 stations were spread over, nine in Punjab, five in Haryana, and six in Himachal Pradesh, with the main research station in each of the region located at one of the campuses i.e., Ludhiana, Hissar and Palampur. In all the colleges and research stations, there was a provision of about 520 research workers in the ranks of Professors, Associate Professors, or equivalent, Assistant Professors or equivalent, and Research Assistants. In view of the high standards of qualifications laid down for recruitment, more than 150 of these positions were lying vacant during the last year. In spite of this, there has been a very good compliment of workers in various disciplines to man as many as 126 research projects in agriculture and 19 in veterinary and animal sciences supported by funds from the State, Indian Council of Agricultural Research, PL-480, Atomic Energy, Ford Foundation and Tata Fission. Of significant importance are works, in Plant Breeding, on Hybrid Bajra, selection from Mexican Wheats, Composite Maize, Soyabean, Sugarcane, long staple Cotton and Groundnut. Considerable work has been done in horticulture on sweet oranges, grapes, tomatoes, melon and other vegetables. The Department of Soils continued to strengthen its work on soil nutrients particularly in relation to the wide spread use of high-yielding soil exhausting crops. Micronutrient deficiencies which are showing-up in the wake of exploitive agriculture are now being examined intensively. The impact of research in agricultural engineering is remarkable. The industry has already taken-up manufacture of reapers for harvesting wheat, the prototype of which was developed in the University. The college is now

developing prototypes of groundnut digger and shaker, and potato digger.

The outstanding example of a successful extension programme is the large scale use of dwarf wheats in Punjab. In 1965, when the dwarf varieties of wheat made their appearance, erstwhile Punjab produced in all 1.9 million tons of wheat whereas last year the divided Punjab, with much less acreage has produced 4 million tons of wheat in one crop. More than 90% of the land under irrigation has been put to dwarf wheats. Such a sweeping change in just four years is a tribute to the extension agency of the State Government and the close collaboration of the University's extension advisory agency with the State. Another outstanding extension programme of this University has been the training programmes offered to inservice personnel engaged in agriculture, and to the farmers. For farmers these are held twice a year at the district, sub-division, block and village levels well in advance of the *kharif* and *rabi* sowings. Courses of one week to three month, duration are also offered to farmers on specific subject-matter like, farm machinery, poultry etc. During the year 1968-69, sixty such courses were offered benefiting 3539 farmers. Training and refresher courses are offered from time to time to persons directly related with agricultural development. During 1968-69, ten such courses were offered benefiting 559 trainees.

Like the U.P. Agricultural University, this University in the Punjab has blazed a trail in many fields. Its contribution to the agricultural prosperity of the State has been unexcelled. In the fields of resident instruction, it has introduced many innovations like the U.P. University. Its achievement by evolving hybrid *Pennisetum* (Bajra) has been acclaimed all over the country. It has also evolved an extension education programme enlisting the active cooperation of the State agencies, while its farmer training programmes are perhaps the most active in the country.

Haryana Agricultural University

Consequent on the partition of erstwhile Punjab State into Haryana and Punjab States, a part of Punjab Agricultural University within the State boundaries of Haryana State came into being under the name "Haryana Agricultural University".

varietal-cum-manurial trials on citrus and grapes have been initiated.

The College of Basic Sciences and Humanities has eight departments, (i) Botany and Plant Pathology, (ii) Chemistry and Bio-Chemistry, (iii) Economics and Sociology, (iv) Genetics, (v) Mathematics, Physics and Statistics, (vi) Microbiology, (vii) Zoology and Entomology and (viii) Languages and Culture. The college does not award under-graduate degrees but provides fundamental courses in Basic Sciences, Humanities and Social Sciences to the students of other constituent Colleges of Agriculture, Animal Sciences, Veterinary Medicine, Agricultural Engineering and Home Science. The college has a post-graduate programme for both M.Sc. and Ph.D., in various disciplines.

Research work in the Department of Microbiology is centered on two aspects,

- (a) Biological nitrogen fixation using effective strains of *Rhizobium* as seed inoculants for a variety of legumes ;
- (b) Industrial microbiology relating to the production of several types of wines, carbonated grape juice and production of citric acid from molasses.

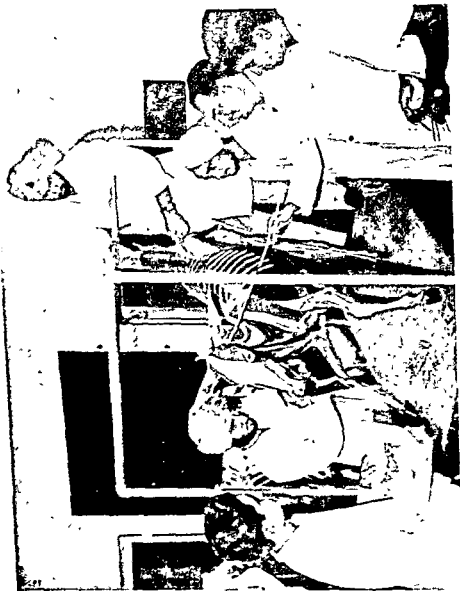
The Department of Livestock Production and Management is currently engaged in a study of the microbiological quality of city milk supply with a view to elucidate the incidence of *Staphylococci* in commercially pasteurised milk.

The College of Veterinary Medicine established in 1948 came under the Punjab Agricultural University in 1966. It is now a constituent college of Haryana Agricultural University. The teaching facilities available upto under-graduate level have been extended to M.V.Sc. and Ph. D. The College has eight departments, (i) Anatomy and Histology, (ii) Bacteriology and Hygiene, (iii) Physiology and Pharmacology, (iv) Pathology, (v) Parasitology, (vi) Medicine, (vii) Surgery and Radiology, and (viii) Gynaecology and Obstetrics.

The College of Animal Sciences of the University established in November 1966 is the first of its kind in India. An extensive farm with adequate cattle, sheep, goats and poultry besides a well equipped three story building of modern architecture offers necessary facilities to develop research, teaching and extension on feeding, breeding, reproduction and management of livestock and poultry. It has four departments viz., (i) Animal



Outdoor classes — informal but effective for teaching. Better contact and understanding between the teacher and the student—PAU, Ludhiana



Anatomy class in session at the Veterinary college,
Haryana Agricultural University, Hissar

Breeding, (ii) Animal Nutrition, (iii) Animal Production and Management, and (iv) Animal Physiology. The college offers a four-year degree programme for B.Sc. (Animal Sciences) after higher Secondary or Pre-University with science or Agriculture. The College also offers post-graduate courses in all the four fields of specialisation leading to the award of M.Sc. and Ph.D.

Research programmes of all departments of Veterinary and Animal Science are coordinated by a joint Director of Research (Veterinary and Animal Science), and research on crops in all the departments is coordinated by a Joint Director of Research (Agri). The overall research coordination is with the Director of Research.

The State Government has vested the entire responsibility for all research in agriculture and animal husbandry to the University. Besides an all-round research programme at Hissar Campus, the University undertakes regional research at four experimental stations at Gurgaon, Karnal, Rohtak, Yamunanagar. Two more stations, one in Karnal District and the other in Mahendragarh District are contemplated.

Under the capable leadership of Mr. Fletcher, the Vice-Chancellor, the University's future is well set to attain its cherished goals.

The future programme of the university envisages the establishment of a College of Home Science, an Institute of Food Science and Technology, a modern student's centre with a stadium, swimming pool, gymnasium and cafeteria. At no distant date the University will have its own printing press and a communication centre. To encourage farmers' visits, special housing facilities have been provided and extension of these are being contemplated.

The University of Agricultural Sciences, Bangalore

The Mysore Government's draft proposals for the establishment of a Rural University, were based on the grounds of urgency of bringing about rapid increase in food production in the State. It necessitated the reorganisation of the existing pattern with the aim of bringing about greatest possible cooperation of the organisations serving agriculture. The Government recognised that there was need for establishing much closer interrelationship between research, teaching and extension pro-

grammes, which was not possible under the existing arrangements. The jurisdiction of the university was to extend over the entire State. The university was to have its campus at Hebbal and was to take over the present Agricultural and Veterinary Colleges at Hebbal and the Agricultural College, Dharwar, Gram Sevak Training Centres, Agricultural Schools and all Agricultural Research and Experiment Stations established in the Departments of Agriculture, Animal Husbandry, Horticulture and Fisheries.

The Cummings Committee, however, advised the Government of India in January, 1962, that it doubted the wisdom of taking over the Agricultural schools since these might constitute too heavy an administrative burden well below the university level and might weaken the university's ability to cope adequately with university level programmes.

Earlier in July 1961, the Cummings Committee at the request of the Chief Minister of the State, prepared a note on the anticipated distribution of functions between the extension service of the Agricultural University and the Departments of Agriculture and Animal Husbandry, in which it is specifically stated : "the University of Agricultural Sciences should have responsibility for extension functions which are primarily educational in character, and the departments of Agriculture and Animal Husbandry would carry on rest of the functions now assigned to them in the supply, service, developmental and regulatory fields".

The Mysore Legislature through their Act No. 22 of 1963, approved the establishment of the University of Agricultural Sciences with State wide jurisdiction with the objectives of (i) providing higher education in the area of Agriculture, Horticulture, Veterinary and Animal Sciences, Fisheries, Agricultural Engineering, Home Economics and allied Sciences, (ii) furthering frontiers of knowledge through systematic research in the above disciplines, and (iii) extension or the transmission of the knowledge gained through research to rural people for adoption in their field practices.

The University was inaugurated on August 21, 1964, when Dr. Zakir Husain in his address set forth the lofty objectives of the University in the following words ; "by bringing about significant improvement in every phase of rural life, by much needed change in methods of production, by influencing the whole out-

look of the rural community and rural home, by giving them a new vision and new hope, this University will be able to make great contribution to national welfare".

The actual functioning of the University started on October 1, 1965, when Government, in pursuance of the provisions of the Act transferred the administrative control of the Colleges of Agriculture at Hebbal and Dharwar, the Veterinary College at Hebbal and 35 Research Stations located in the various parts of the State. Along with these experiment stations, a total of 40 research schemes sponsored by the Indian Council of Agricultural Research or State Government came also under the control of the University.

July 12, 1969, is a land mark in the annals of the Mysore University of Agricultural Sciences when the new campus of the University was inaugurated by Mrs. Indira Gandhi, Prime Minister of India and was christened as Gandhi Krishi Vigyana Kendra—a name that is more than appropriate for the reason that "The University of Agricultural Sciences is dedicated to the cause of common people of villages and towns whose welfare was dearest to the heart of Mahatma Gandhi and the main campus of the University is named after him so as to constantly remind the teachers, students and scientists who work there of their responsibilities to the masses of our country". Still more significant was that on the same occasion, corner stones were laid for the University Library, Administrative block, and College of Basic Sciences and Humanities. All this is only a small part of the master plan envisaged and the campus will stand for generations to come as a symbol of what the present generation endeavours to do to remove from the face of India the blot and stigma of food scarcity, malnutrition, archaic farming methods and economic backwardness of the rural areas.

Unlike in other universities, this University was able to settle the terms of transfer of all Government employees well ahead of the actual transfer of the institutions. This enabled everyone to opt to the university with a full knowledge of the implications and prospects. The State Government also agreed to the grant of the University Grants Commission's pay scales to all the technical staff members of the university before the option was exercised by the employees.

As the very first step in the direction of improvement of

teaching the university introduced the Trimester system of education in B. Sc. (Agri) and B. V. Sc., programmes in place of the examination oriented traditional pattern of education. To this end considerable preparatory work in drafting course outlines and curricula, training of the staff to imbibe the ideals of the new system and adopt themselves to the new set-up was carried out. The new system is a teacher centred programme of motivating the student to learn, to critically assess and to apply knowledge to problems that confront him in life.

The academic year is divided into three terms of 14 weeks each called a 'Trimester'. All the subjects are split up into self-contained units designated as courses capable of being taught in a specified number of hours in a trimester. Greater emphasis has been laid in the trimester system on the teaching of Basic Sciences and Humanities. The introduction of students at the very first year to subjects like Psychology, Economics, Sociology, besides science subjects helps the student to develop an integrated outlook on problems of life. A separate college with full-fledged departments in these subjects started functioning from 1966.

To overcome the lack of facilities in the State for post-graduate studies in Agriculture and to provide the necessary fillip for advanced teaching and research, the college of post-graduate studies was inaugurated in 1966. At present, facilities are available for pursuing studies leading to M. Sc., (Agri) degree in Soil Science, Plant Pathology, Entomology, Agricultural Microbiology, Agronomy, Agricultural Botany, Agricultural Extension and Agricultural Economics and M. V. Sc., degree in Veterinary Pathology. Ph. D. courses are offered in Soil Science and Agricultural Microbiology, and will be offered in four more subjects viz., Entomology, Pathology, Veterinary Microbiology and Veterinary Pathology from the academic year 1970-71.

Training in Fisheries Science at a high level and systematic research is a necessary step towards efficient husbanding of the State's fish resources. A College of Fisheries Science, offering a four-year B. F. Sc., degree course started at Mangalore in 1969. It is the first institution of its kind in this part of the world. An Institute for Agricultural Engineering started at Raichur constitutes the nucleus of an Agricultural Polytechnic recommended by the Education Commission (1964-1966). The nuc-

leus of the home science faculty and a bakery school offering short term courses in Bakery Science have also been functioning at Hebbal since 1967.

Veterinary medical students receive practical experience as a *result of the ambulatory clinic programme* initiated at the university. It provides facilities for livestock owners in rural areas to use this service and at the same time provides additional clinical material for student training.

Agricultural research in the State has been reorganised in relation to agro climatic needs of the different regions. Five Regional Research Stations with locations at Bangalore, Dharwar, Mandya, Mudigere and Raichur have been established to cover all facets of agriculture like plant sciences, animal sciences and social sciences in a balanced manner. Collaborative and team approach among scientists to find solutions to problems in different disciplines is the basis of the organisation. The Regional Research Stations are adequately provided with trained personnel and modern equipment on a scale as never before.

Considerable thought and attention have been given to the development of research on drought and rainfed agriculture as a whole. Of the 18 crop varieties released by this University, 10 are designed for the uplift of rainfed farming. Research has now been oriented to render the crops and crop growing practices in rainfed areas more dependable. New release of improved crops like *Muguthi Jola* in jowar (rabi), *Suma* and *Kusuma* in paddy; *Mysore Vijaya*, *Hampi* and *Varalaxmi* in cotton are the highlights of improved crop variety releases made in 1969.

In the field of extension education, the university embarked on a big project to raise hybrid maize and hybrid sorghum on over 10,000 acres of irrigated land, which involved very intensive educational work by a small field staff for nearly one year. *Based on the experiences of this project in 1966* a more ambitious project on an extended area of over 20,000 acres was taken up in 1967 with the technical and financial aid from USAID. In both these projects the fertilizers required came on rupee payment from OXFAM, and to a small extent from the Government of India for one of the projects only.

A radical reform in administrative procedures and systems was another task towards which the university devoted major

attention. This involved not only considerable reduction in the strength of non-technical staff transferred to the university but also far-reaching changes in procedures designed to economise time and funds while ensuring efficiency and expeditious disposal. The most important effect of these changes is that the technical personnel have been freed from much of the routine administrative drudgery.

Certain measures taken to promote students' welfare and discipline have also proved encouraging. Student counselling is an important innovation introduced in the University, wherein a group of 15-20 students is attached to a teacher who maintains close contact with the students and helps them not only in their curricular problems but also in their individual or personal problems. This has paid rich dividends in maintaining a disciplined atmosphere and promoting a sense of belonging.

The periodic meetings of the Vice-Chancellor with the students and staff provide an excellent opportunity for maintaining close contact between the students, staff and officers of the university. During these meets, free and frank exchange of views is encouraged between the students and the authorities making for the growth of a sense of partnership in the running of the University, and for a prompt redressal of grievances.

Apart from USAID assistance in various forms, the valuable help the Ford Foundation extended to strengthen the teaching, research and extension activities in the field of plant protection, enabled this University to strengthen its post-graduate training programmes in the line and to develop a service agency of growing value to farmers.

Whatever this University has endeavoured to do so far, was based on the conviction that it is only by examples and not by precepts that education, research and public service could become effective. To set an example, introspection and self-analysis are pre-requisites. Quality at lower cost, a democratic set-up freedom for teachers and scientists to discharge the duties for which they have been equipped, and for the students to achieve their purpose for which they were enrolled—these have been the varied objectives in this university's plan to modernise traditional farming of the State of Mysore, with the University serving as one of the main instruments.





ICAR officials from Delhi at the Pintos homo farm. Seen in the picture are Dr. O. P. Gautam, Deputy Director General (ICAR) and Dr. D. M. Thorpe, Chief of Party USAID, Bangalore

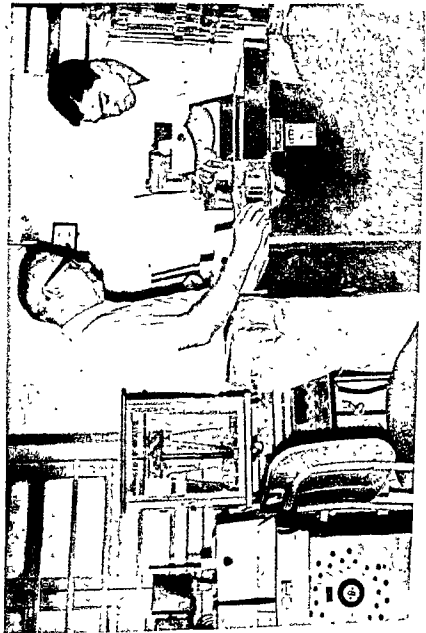
Andhra Pradesh Agricultural University

This University has three campuses ; the main campus is at Rajendranagar near Hyderabad, the State Capital of Andhra Pradesh ; and the other constituent colleges at Bapatla in Guntur District and Tirupati in Chittoor District. The Andhra Pradesh Agricultural University Act, 1963, received the assent of the Governor on December 27, 1963 and came into force from May 4, 1964. The Act provided for the transfer of the following colleges to the University and the transfer was actually effected on July 10, 1964.

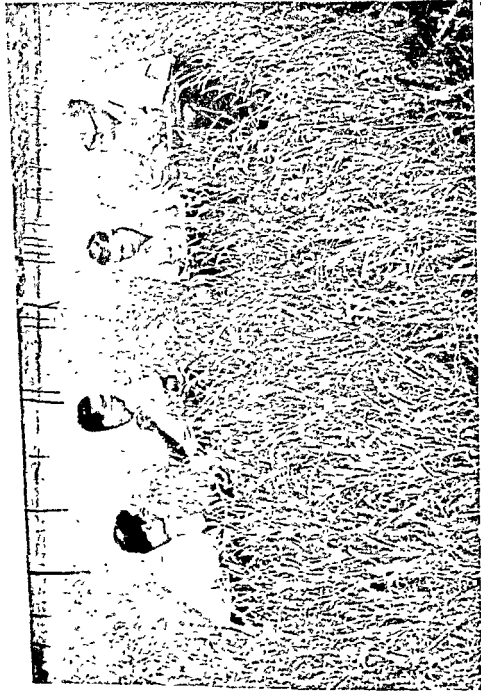
- | | |
|---|--|
| (1) College of Agriculture, | } Colleges of the
Osmania University |
| Rajendranagar | |
| (2) College of Veterinary
Science and Animal Hus-
bandry, Hyderabad | } A Government College affilia-
ted to Osmania University |
| (3) College of Home Science,
Hyderabad | |
| (4) Agricultural College,
Bapatla | } A Government College affilia-
ted to Andhra University |
| (5) Sree Venkateswara Agri-
cultural College, Tirupati | |
| (6) Andhra Veterinary College,
Tirupati | } Government Colleges affiliated
to Sree Venkateswara Uni-
versity |
| | |

The draft Bill introduced in the State Legislature of Andhra Pradesh in 1961 for establishing the Agricultural University was shaped in the light of recommendations made by the Cummings Committee, which visited the State in September-December 1960. The one material change made by the State Government, however, was to phase the implementation of the integration of teaching, research and extension on a State-wide basis.

On July 10, 1964 Shri O Pulla Reddy, I.C.S. (Retd) assumed charge as the first Vice-Chancellor and the University was formally inaugurated by the Prime Minister of India on March 20, 1965. Until the Board of Management was constituted, a Committee of Management with the Vice-Chancellor as Chairman and seven officers of the State Government as members was constituted, which functioned till March 8, 1965, when the Board of Management took over the functions. At its first meeting the Board elected a non-official member of the Legislative Assembly as the Chairman. The experience of



APAU, Rajendranagar—Dairy Project in cooperation with USAID and National Dairy Development Board. Picture shows Dr. Paul E. Johnson, Dairy Technologist and his staff.



APAU, Rajendranagar—Grassland. Project in cooperation with USAID and Kansas State Univ. Picture shows Dr. Vernon C. Larson, Chief of Party and Mr. Robert J. Raney, Irrigation Advisor (1st and 2nd from right) with Indian counterparts

offered in six subjects (Agronomy, Agricultural Botany, Soil Science, Entomology, Plant Pathology and Agricultural Economics) at the main campus Rajendranagar. Similar facilities are available at Bapatla for Botany (Plant Physiology) and Horticulture at Sree Venkateswara Agricultural College, Tirupati. In 1970-71, with partial financial assistance of the ICAR, New Delhi, the postgraduate programmes of M.Sc. Ag., were strengthened to include Agricultural Chemistry and Entomology at Bapatla and at Tirupati in the subjects of Agronomy and Plant Pathology. The Ph.D programme at Rajendranagar is said to be in its final stages of approval. The oldest of the Agricultural colleges of Andhra Pradesh located at Bapatla celebrated its Silver Jubilee in April 1971 in a fitting manner.

In the faculty of Veterinary science a 5 year B.V.Sc. degree course and 2 year M.V. Sc., degree course have been instituted at Rajendranagar and Tirupati. In the faculty of Home Science, the College of Home Science, Hyderabad, offers a 3 year B.Sc. (Home Science) degree course and a 2 year M.Sc. in Food and Nutrition.

Since inception, the university introduced the trimester and internal evaluation system. But there are conflicting reports within the university itself as to the value or success of these innovations.

The University assumed responsibility for Agricultural Research in the entire State of Andhra Pradesh with effect from 1st July 1966, when 41 Research Stations and 104 schemes with all the attached personnel were transferred from the State Department of Agriculture. Subsequently on May 1, 1967, twelve Research schemes and Stations with the personnel working in them were transferred from the State Department of Animal Husbandry.

Efforts of the All India Coordinated Rice Improvement Project, with its headquarters at Hyderabad helped in the breeding of varieties suitable for the soil and climatic environment of Andhra Pradesh, besides meeting the demand for finer grain quality from the consuming public. A long grained fine variety *Hansa* is in part the result of such work, which the extension wing of APAU decided to release to the farmers.

'Krishna' a variety of Cotton bred for rice fallows in coastal districts was found suitable for Rayalaseema and was much

appreciated for its yield and higher spinning quality. The variety 'Amber composite' in Maize has achieved significant success. In sugarcane, Co 62175 was found suitable for late crushing.

A valuable Sorghum germ plasm bank is located in this university, containing 10,000 different kinds of Sorghum gathered from all parts of India, Africa, USA and other parts of the world.

The Indian Grain Storage Institute established at Hapur (near Delhi) by the Government of India has also a substation at the Agricultural College, Bapatla to study the possibilities of reducing the percentage of wastage of grain through introduction of storage innovations. A package of improved technology has been developed for the Telangana region of A.P.* With financial assistance of ICAR a pilot study is under way in that area to assess the cost benefit relationship of the practices. For the *rabi* crops grown on black soils a package of practices has been developed and is being tested on a limited scale.

Although the University Act, of 1963 provided for the establishment of Agricultural Extension Service to the entire State of Andhra Pradesh, for obvious reasons, it had to be carried out as a phased programme. In the first phase the Extension programme was taken up in eight blocks of Hyderabad district during 1967. In Chittoor, District services provided for one block have been extended to cover four more blocks in 1969-70. Extension service in one block of Guntur District was expected to function during 1969-70. As resources permit, the intention is to cover as speedily as possible more areas of the State.

An Institute of Extension Education financed by the Government of India functions as a part of the Agricultural College at Rajendranagar. It undertakes the training of extension officers deputed from different State Governments, in addition to offering post-graduate courses to qualified agricultural graduates. The extension education department at Rajendranagar conducts short-course training programmes for teachers and sons of farmers.

An Agricultural Information and Communication Centre has been established with the assistance of the KSU-USAID in October 1969 for producing information material to disseminate

* Farmer and Parliament, December, 1969. P. 17-23.

improved knowledge in agriculture, animal husbandry and home science.

Since 1954 a bi monthly scientific journal "Andhra Agricultural Journal" is being published as an official organ of the Andhra Agricultural Union, with its head-quarters at the agricultural college, Bapatla. The Radio Farm News Bulletin started early in 1969 to serve the farming community in the State is proving increasingly popular. A new feature introduced in 1970 is a monthly News Letter highlighting important activities of the University in the different disciplines.

University of Udaipur

After passage in the State legislature of the Rajasthan Agricultural University the Bill received the assent of the Governor on June 6, 1962. Mr. G. B. K. Hooja joined on July 5, 1962 as the first Vice-Chancellor of the Rajasthan Agricultural University. The Rajasthan Agricultural University (Amendment) Act of 1963 was passed by the legislature and received the assent of the Governor on October 28, 1963. The amended Act limited the jurisdiction of the University to the boundaries of Udaipur Municipality and campuses at Jobner and Bikaner, at the same time changing the name of the University to Udaipur. Dr. G. S. Mahajani assumed the responsibilities of the first Vice-Chancellor under the amended Act on November 20, 1963.

While introducing the Rajasthan Agricultural University Bill in the State Legislature, the then Minister for Agriculture had declared that there was a need for establishing closer interrelationship between research, teaching and extension programmes.* This ideal has been rendered difficult of attainment with the amendment of the Act restricting the operation only to a municipal area and to small campuses in the State. The circumstances which led this University to currently pride itself with a name unconnected with agriculture are manifold. Perhaps, the inspiration for the change came originally from the notion that a University could fulfill its role suitably only if it was "a multi-faculty University". Traditional University experience of the leadership would urge for a change which would remove many

* Rajasthan Agricultural University, Udaipur, First Annual Report, 1962-63.

features of the system which is unfamiliar. Clash among the personalities representing the superior staff of the University and manoeuvring by politicians engendered by personal, regional or institutional loyalties may have also claimed a large share of the responsibility for the rather unusual present set-up at Udaipur.

The State Government transferred the Colleges of Agriculture at Udaipur and Jobner and the College of Veterinary Science and Animal Husbandry at Bikaner to the University on August 1, 1962, on a 20 year lease on an annual rent of rupee one. The agricultural land attached to the three Colleges was also given to the University on lease on payment of the usual land revenue by the University to the Government.

In 1963-1964, the State Government transferred 'fundamental research' and handed over to the University two laboratories in Agricultural Chemistry and Plant Pathology in Udaipur and the laboratory in Entomology in Jobner.

Same year, with the aid of Ohio State University which supplied \$82,000 worth of dairy equipment, and of State Government's grant of Rs. 4 lakhs, the University launched what it called as an "educational and commercial" project to supply up to about 5000 litres of milk to the public and sell ice-cream, butter and ghee.

In July 1964, the following institutions also came within the purview of the University :

- (1) Maharana Bhupal College—as a constituent College to serve as school of Basic Sciences and Humanities;
- (2) Rajasthan Mahila Vidyalaya—Home Science College as affiliated institution;
- (3) School of Social work (Post-Graduate) as affiliated institution;
- (4) Teachers' Training Colleges (Post-Graduate) as affiliated institution ;
- (5) Meera Girls' College as affiliated institution and belonging to Government ;
- (6) Shramjeevi College (Evening College) as affiliated institution ; and
- (7) Bhupal Noble's College as affiliated institution.

A College of Agricultural Engineering was started in July 1964, as a constituent institution but it was to operate in

cooperation with the Udaipur Polytechnic—employing the part-time services of its teaching staff as well as utilising its facilities.

In 1966, the University College of Home Science was added to the University as a constituent College.

This co-existence of the traditional affiliating system with the modern land-grant system of constituent colleges is undoubtedly unusual and its possible implications are yet to be fully understood. Neither the US Advisors nor any one among the faculty members seemed enthusiastic of this combination.

The impression that one gathers is that the institutions functioning as constituent components of the University are not receiving adequate attention and this may be mainly due to the lack of conviction among some of the key officers. The utilisation of staff from a polytechnic to teach at the undergraduate level is also a venture on which opinions may differ.

The training of students in basic sciences and humanities is done in the professional colleges, even though the Maharana Bhupal College which is a constituent college is close to the College of Agriculture in Udaipur and is continuing on the traditional pattern, partly due to a strong tendency among the existing staff of this college to maintain the *status quo*.

In July 1964, the semester and internal grading systems were introduced in some of the colleges, but with a difference. This consisted of the introduction of a final examination at the end of each semester with 50% of the total weightage to the final examination. What is remarkable is the fact that the new systems were introduced simultaneously in all classes, which must have meant an abrupt switching over from a traditional system to the new one after varying periods of exposure of the students to the former system. These facts could have caused many academic problems. But they did not, because during the previous summer vacation, Dr. Ronald Thompson (Adviser to the Registrar) prepared the ground. He first reduced all procedures to writing and held four seminars with the staffs of the colleges and initiated them into the system. He visited each of the three campuses, met faculty members and students, collectively in groups and at times singly and removed their doubts and misgivings. However, to what extent the recurring student strikes were symptomatic of these and other problems arising from the peculiar set-up, it has not been possible to determine.

One feature of post-graduate programmes undertaken in this University and also at the UP Agricultural University is of some interest. Both these universities are presently offering post-graduate courses in subjects outside the scope of Agricultural Science's such as in pure Botany, Chemistry, Physics and Zoology in Udaipur and in Civil, Mechanical and Electrical Engineering in Pantnagar.

In 1965-66, a further step, which adds to the innovations made by this University, was taken by adding to the group of institutions—constituent and affiliated—yet another in the form of a Rural Institute, located outside Udaipur Municipality. The Udaipur Rural Institute is one of thirteen Institutes controlled by the National Council of Higher Rural Education. It is reported that this Institute will have to maintain its special features and functions according to the concept of "autonomous colleges". Indeed, this is an example of a collection of several autonomous institutions with widely differing objectives and philosophies. Notwithstanding these features, it was found possible for this University to appoint the Director of the Rural Institute as Director of Student Welfare of the University on a part-time basis.

A site of 7,000 acres lying as "agricultural waste and pasture" was selected about 23 miles from Udaipur and was transferred by the State Government in 1965-66 for establishing an experimental farm.

Dr. Leonard D. Bayer, Chief of Party, Ohio State University team at Udaipur, has recorded in his report for 1965-66, "Although this highly qualified College (M.B. College) with its basic sciences and humanities is part of the university, there is no integration of its teaching with that of the College of Agriculture".* He further adds that the integration of M.B. College with the College of Agriculture is one of the internal problems of the developing University that must be solved before there can be a strong institution. The fact that M.B. College functions under the traditional system of external grading while the College of Agriculture is using internal grading adds to the complexity of the problems. Referring to Research, Dr. Bayer says that whatever research the departments are doing is not coordinated with the Director of Research. The few resources

* Annual Report the OSU/AID November 1, 1965 October 31, 1966,

A communication centre was set up towards the close of 1967 to deal with farmer's problems. Rural broadcasts have been made by subject matter specialists of the University from All India Radio, Jaipur.

The pilot milk supply scheme launched by the University has been of educative value to the students, besides being of benefit to milk producers. The poultry industry in the State has also achieved new dimensions in production of eggs for export. The university's role in these developments has been significant.

There has also been some progress in campus development. The buildings to house the college of Technology and Agricultural Engineering and library have been completed. A special Committee has been set up for academic planning and development in the next 10 years.

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

The Madhya Pradesh Legislative Assembly passed an Act for "establishing and incorporating a Krishi Vishwa Vidyalaya (Agricultural University) for Education" in 1963. It was on the suggestion of the Corporation of Jabalpur that the University was named after Pandit Jawaharlal Nehru. The University was inaugurated on October 2, 1964 by Shrimati Indira Gandhi, who was then the Union Minister for Information and Broadcasting.

On December 1, 1964, the State Government transferred all the six Agricultural Colleges and two Veterinary colleges together with the 18 Research farms and the research establishments and farms attached to the Colleges to the University.

The first Vice-Chancellor, Dr. J. S. Patel, assumed his responsibilities on June 17, 1964. Coming as he did from the Government of India, where he was the Agricultural Commissioner, Dr. Patel was able to bring to bear on his new assignment his rich experience in Agricultural Research, Education, Extension, which proved an asset to this University. Until the institutions were transferred to the control of the University, Dr. Patel had a very useful period for preparatory work and planning, which augured well for the future. Dr. I. S. Negi, who succeeded him on March 20, 1968 had distinguished himself as Director of Agricultural, Himachal Pradesh, besides

having had experience of working as a Dean at the Punjab Agricultural University.

Among the institutions transferred to the University are (1) the College of Veterinary Science and Animal Husbandry at Jabalpur, (2) the College of Veterinary Science and Animal Husbandry at Mhow, (3) the Agricultural Colleges at Jabalpur, Raipur, Rewa, Indore, Gwalior and Sehore making a total of eight colleges at seven campuses. On August 17, 1966 the faculty of Agricultural Engineering came into existence at Jabalpur, but the enrolment for engineering courses commenced actually in August 1967 with admission of 35 students for the I Year. A part of the proposed buildings for the college of Agricultural Engineering was expected to be completed by mid 1970 at a cost of Rs. 6 lakhs with the ICAR assistance.

Like other Agricultural Universities in India this University offers a four-year degree course in Agriculture and five-year degree courses in Veterinary and Agricultural Engineering, after Higher Secondary Examination. Post-graduate courses are offered leading to M. V. Sc., and A.H. and M.Sc. (Ag) in all the subjects. Out of the total students on roll in all faculties, 18.4 per cent are in post-graduate courses.

Basic Sciences and Humanities do not yet enjoy the status of a faculty in this University. It is hoped that with the programme of strengthening and expansion of the departments already in hand a school/college of Basic Sciences and Humanities will come into being during the Fourth-Plan. The possibility of the university having a college of Home Science, however, seems remote since Home Science college, affiliated to the University of Jabalpur already exists at Jabalpur. It is, however, Planned to have a department of Home Science for Post-graduate teaching and research and locate this department in the College of Agriculture. It is also proposed to develop the existing Fisheries Section into a full fledged Department of Fisheries for research and offer under-graduate and post-graduate courses.

The University adopted the trimester system and internal evaluation right from its inception. This created a number of problems in the first two years; but later the teachers and students have adjusted themselves to the new pattern. Uniformity in the standard of teaching and evaluation of students

performance presents a problem specially in a University with seven campuses. This is further accentuated by the fact that four of the off campuses (Raipur, Gwalior, Rewa and Sehore) changed the medium of instruction to Hindi at the undergraduate level.

English continues to be the medium of instruction at the main campus Jabalpur and the two off campuses at Indore and Mhow. The post-graduate instruction continues to be in English and no change is visualized here in the foreseeable future.

UGC scales of pay for the University employees were granted from January 1, 1967. All teachers, research and extension workers have been given old UGC scales of pay with effect from January 1, 1969. This step has considerably helped in removing the under current of discontentment prevailing amongst the teachers since the university came into being. The University has also adopted a scheme of merit promotions and advanced increments based on out-standing accomplishments more or less on the lines adopted by the Punjab Agricultural University. An amendment to the University Act in November 1965 enabled the transferred State Government employees to opt to the State Government, if they so desired.

Each of the campuses of the University located in one agro-climatic region of the state is suited for resesarch on applied agricultural problems of the region concerned. To this end, the physical facilities already available at each campus are being taken advantage of. The main campus at Jabalpur with a farm area of 450 acres attached to it and fairly well-equipped research laboratories constitutes the central research institute of the University to tackle problems of importance to the state as a whole. This caters also to the needs of instruction at all levels specially for post-graduate courses leading to M.Sc., and Ph. D. The gradual shifting of all post-graduate intruction to this centre is contemplated by the university, and this is justified both from the viewpoints of economy and maintainance of high standards in education and research.

Research on crop improvement, soil and water management animal diseases and their control is being pursued according to a project plan, with specific objectives. Three new varieties of Rice (Norin I, Cross 116 and Safri 17), two of Wheat (HY 65,



A canine surgical operation being demonstrated to students at JNKVV, Jabalpur : 1P2



"When you educate a man you educate an individual when you educate a woman you educate a whole family." —Extension wing of JNKVV demonstrates this in the villages

HY 633), and one of Cotton (Khandwa-I) have been released and each is acclaimed for its superiority in quality and yield over varieties already in cultivation. Amongst the large number of soyabean varieties under trial "Bragg" recorded the highest yield of 40 to 45 quintals per hectare. Simple fertilizer trials conducted on the cultivators' fields have enabled the University to identify low yields in certain areas due to phosphorus and potassium deficiency. Introduction of sugarbeet cultivation at Jaora has indicated that it would be helpful in extending the working season of sugar factories and increasing their production as yields of 75 tonnes of sugarbeet per hectare with 15 to 17 per cent of sugar have been obtained under proper management.

Surveys of helminth parasites of pigs, cats, buffaloes and sheep have been made at Jabalpur and Mhow. Similar surveys for boccidia parasites have also been made with pigs and local fowl. The nematode *Thelazia gulosa* infecting the eyes of buffaloes has been recorded for the first time in India. Three fowl pox virus strains have been isolated from outbreaks in experimental birds. A local strain of spirochete, immunologically distinct from IVRI vaccine strain, has been isolated from fowls. Cross breeding programme in dairy cattle by using frozen semen of exotic animals has been initiated on a small scale.

In the field of extension education a vigorous programme for farmers with training facilities for village level workers, extension staff of State Department of Agriculture and Veterinary Sciences has been undertaken through periodical refresher courses, workshops and seminars. This gains further support through publication of folders, pamphlets and circulars in agriculture and home science. A special wing to educate farm women in better home-making has started and is functioning with a contingent of eight lady extension teachers.

A weekly radio broadcast in collaboration with the AIR and regular film shows on Agriculture and Home Science topics have been undertaken to cater to the needs of farmers in remote areas of the State. Extension Specialists at the Agricultural Colleges and selected research centres were actively engaged in the conduct of 92 National demonstrations on multiple cropping throughout the State during the year 1969-1970.

A communication centre was established at the University with the support of US Agency for International Development through the University of Illinois contract. This university in particular has taken special interest in students welfare even after their graduation. To this end, a Students' Guidance and Employment Bureau has been set up to assist the students of the University in gainful employment and higher education.

A healthy and cordial process is at work to bring an effective integration of extension functions between the state departments and the university through a coordination committee of officials from both sides. The research functions have been strengthened with the operation of 15 All India Coordinated research schemes including 10 research schemes financed by ICAR in both Agriculture and Animal Husbandry and a few projects financed by USAID.

Laboratory facilities were substantially strengthened with the establishment of radio-isotope laboratory, type culture collection centre for *Rhizobia*, a wheat research laboratory at Powarkheda and significant expansion of the library in both space and reading material. The concern of the university in promoting students welfare by mutual discussion between Vice-Chancellor and senior staff members and student representative at frequent intervals enabled to enhance mutual cordiality and respect. The development of the campuses at Jabalpur and other centres to promote better living conditions of staff and students in several ways has made good progress.

Orissa University of Agriculture and Technology

The Orissa University of Agriculture and Technology was inaugurated on August 24, 1962 by Professor John Kenneth Galbraith, then U.S. Ambassador in India. The University came into being after the State legislature passed Act 20 of 1961, which was later repealed and the Orissa Act 17 of 1965 came into force from November, 1965. The two Government Colleges namely, the College of Agriculture and the College of Veterinary Science and Animal Husbandry were transferred to the control of the University with effect from February 1, 1963 along with the State-owned Agricultural Research Station at Bhubaneswar. Subsequent to the establishment of this University, two outlying Research Stations, one at Berhampur and

the other at Jeypore, were transferred to the University in October 1963. Recently, the experimental station at Chiplima (Sambalpur Dt.) has been transferred to serve as a regional research station. The Government are also considering to transfer another research station in the Northern zone of the State.

From the year 1969 the University has been developing in different spheres of activities. The transfer of many research schemes and some farms to the control of the University has enabled the University to develop the tempo of activities in research. The College has recently added a Dairy Farm and Piggery. The College also proposes to have its own Goat Farm for which construction is in underway.

The Orissa Act 17 of 1965 came into operation on November 3, 1965, and with it the Chairmanship of the Board of management went to the Pro-Chancellor of the University. The office of the former President was re-designated as Vice-Chancellor and while the President was not a member of the Board of Management, the Vice-Chancellor is now made a member of the Board and was empowered to act as the Chairman in the absence of the Pro-Chancellor. The post of the erstwhile Vice-President under the old Act was abolished and the Board was enlarged to have 21 members. Also under the new Act, Forestry was included under Agriculture, and an annual block grant of a minimum of Rs. 25 lakhs was assured to the University by the State Government. By the year 1970, the University is actively negotiating with the Government for an increase of this annual block grant for purposes of an all round development of the University.

Recently, many steps have been taken to safeguard the autonomy of the University, and in that direction a number of changes in the Act and the Statutes have been suggested to Government, with the hope that the Act of 1965 and the Statutes of 1966 may be amended. The influence of the Government in the day-to-day affairs of the University is sought to be minimised by these changes in the Act and the Statutes.

The first President and later the Vice-Chancellor was Mr. M.C. Pradhan, a retired Director of Public Instruction of the State Government. Dr. K. Ramiah who succeeded him resigned on the 16th of March 1968. This office was then taken over

by Dr. Banshidhar Samantarai, retired Director of Public Instruction of the State and a well-known scientist in the field of plant physiology.

The University of Missouri entered into a contract with the USAID to assist this University. As in other Universities, assistance of the AID mission and the University of Missouri is available in the shape of training of teachers, provision of some modern equipment, books and journals and some assistance in the shape of rupee projects for betterment of the University. A large number of teachers have so far been trained in the United States and IARI.

Three additional faculties viz., the faculty of Agricultural Engineering and Technology, the Faculty of Home Science and the Faculty of Basic Science and Humanities were added after the University was established. The integration of Basic Sciences and Humanities taught in the agricultural and veterinary courses became effective in the second year of the establishment of the College of Basic Science. The College of Agricultural Engineering and Technology started enrolment in the academic year, 1966-67. The building for this College commenced early in 1970 and is expected to be completed in about an year.

The College of Agriculture has eight Post-graduate departments and the College of Veterinary Science has its Post-graduate teaching facilities in three departments of Pathology, Medicine and Surgery. Further expansion of Post-graduate teaching facilities in both the Colleges may materialise before long.

In the field of extension education, the University has undertaken responsibilities in three extension blocks in Puri district. Negotiations between the State Government and the University have been initiated to take more blocks for extension work. All extension work is under the direction of a whole time officer, the Dean of extension.

A Dean for Students' Welfare looks after matters connected with the students' boarding and lodging. He further guides the working of the university employment information and guidance bureau, established in December 1968. There are six hostels with all amenities and a Health Centre equipped with such

modern tools as of electro-cardiogram and X-ray unit. There are well organised Co-operative Stores and a Canteen.

Students of Agricultural and Veterinary Colleges receive interest-free loan stipends from the Government of Orissa on condition of repayment of the loan after securing employment.

Although this University started as early as 1963, the tardy progress during the past seven years is apparently due to an effective interplay of some peculiar difficulties. The absence of a strong and bold policy by the board of management, lack of financial support by the State Government, and a strong apathy of the personnel transferred from the departments to the University under highly discouraging service conditions may have individually and collectively been responsible for the anaemic condition of the University.

Recent attempts to obviate these constraints deserve mention. Thus, 80% of the staff of different categories constituting the members on deputation from State Government have been permanently absorbed by the University. The decision to grant III Plan UGC scales of pay and allowances to all the employees is indeed gratifying. The changes proposed in the Statutes for better autonomy, if implemented at an early date, coupled with greater financial support and sympathy of the State Government should auger well for quick recovery of the lost ground. If a bold and pragmatic approach is allowed for execution by the Vice-Chancellor, the tardy progress of the past may soon be no more than a memory.

University of Kalyani

Although the University of Kalyani (West Bengal) is not strictly conceived on the Land Grant College pattern, it has in its constitution and function imbibed many of the salient principles of the Land Grant College and may therefore be deemed as an agricultural university to have a place here. The University came into being through an Act of West Bengal Government (Act XIII) known as The Kalyani University and was inaugurated on November 1, 1960 by Miss Padmaja Naidu, then Governor of West Bengal. The statutes currently in operation came into force on April 2, 1965 after their approval by the Chancellor.

The Governor of West Bengal is the Chancellor of the University and the management is vested in a board of seventeen

members with the Vice-Chancellor as the Ex-officio Chairman. Four of the members of the board are the Secretaries of the Government of West Bengal of the Departments of Finance, Education, Agriculture and Animal Husbandry. One representative of the ICAR, New Delhi, three deans of the faculties of Agriculture, Science and Arts and the President of the Board of Secondary Education of the Government of West Bengal constitute five more members. Two persons elected by the teachers and five nominated by the Chancellor are the other members. The Board had its first meeting in February 1960.

The Board of Management is dominated by the representatives of the Government and further the Government has retained certain powers which curtail the autonomy of the university. The Government has for instance a right to cause an inspection to be made by such persons as it may direct on any of the functions of the university in teaching, research and extension.

The Birla college of Agriculture at Haringatta with its experimental farm and the teacher's training college at Kalyani have been transferred to the control of the university. Later four research stations were started for the purpose of teaching and research functions of the university. These are (i) Research-cum-teaching farm at Harringatta (225 acres) and at Mandor' (162 acres) (ii) Central research farm at Gayespur (157 acres) (iii) Research-cum-teaching farm at Kalyani (500 acres—under development) and (iv) Commercial farm-Pilot project Kalyani lake area (30 acres) for banana and papaya cultivation. The extension activities of the department of agriculture of West Bengal have been transferred to the university, but on its own the university developed an extension wing at the college of agriculture. It is designed for (i) conducting demonstrations on farmer's fields, (ii) providing technical assistance to farmers in the shape of soil analysis, crop, cattle and poultry management etc., and (iii) for imparting training to young farmers and organising refresher courses to extension officers.

The University received at the outset a block grant of Rs. 36.19 lakhs from the State Government and from the ICAR Rs. 9.5 lakhs for development and Rs. 90,800 for coordinated research projects. The financial position is deemed quite unsatisfactory for development of the university.

The faculty of Agriculture comprises of a four-year undergraduate B.Sc. Ag. (Honours) course and a two-year post-graduate course leading to M.Sc. Ag. There are ten post-graduate departments (i) Cytogenetics and Plant Breeding (ii) Agronomy (iii) Horticulture (iv) Soil Science and Agricultural Chemistry (v) Soil Conservation and Water Management (vi) Plant Pathology (vii) Agricultural Economics (viii) Entomology (ix) Agricultural Extension and (x) Animal Husbandry.

The faculty of Science (under-graduate and post-graduate) has five departments viz., (i) Physics (ii) Chemistry (iii) Botany (iv) Zoology and (v) Mathematics and Statistics.

Under the faculty of Arts (under-graduate and post-graduate), there are five departments viz., (i) Economics (ii) English (iii) Sociology (iv) Teacher's Training and (v) Physical Education.

The progress of the University has not been as satisfactory as expected, primarily due to financial stringency and occasional student unrest at the campus. Like the UP Agricultural University at Pantnagar it has developed its faculty membership on its own without any transferred personnel from the State department of Agriculture. The facilities at the campus for the students in many respects have been fairly well developed, and a fairly active research programme has been initiated by Dr. S. K. Mukhurjee, its present Vice-Chancellor.

The Punjabrao Agricultural University, Akola (Maharashtra State)

The Punjabrao Agricultural University (Punjabrao Krishi Vidya Peeth) in the State of Maharashtra came into being through Maharashtra Government Act No. IX of 1969. The University was formally inaugurated on 4-4-70 and the relevant Act for this was passed by the Legislature on 8-1-69.

The Governor of Maharashtra is the Chancellor of the University; the Minister for Agriculture of Maharashtra State is the Pro-Chancellor and Chairman of the "Court" of the University. Mr. L. N. Bongirwar, was named as the first Vice-Chancellor of the University for a term of five years.

The Act provides for constitution of the following bodies : (i) The Court (ii) The Academic Council (iii) The Executive Council and (iv) Board of Studies.

The Court is a very large body consisting of many officials

and non-officials drawn from various interests connected with agriculture either directly or indirectly. This seems to be a unique feature of this University and this big body is more or less akin to a Senate of a conventional University. The Executive Council, equivalent to the Board of Management consists of 17 members (9 official and 8 non-officials), with the Vice-Chancellor of the University as Ex-officio Chairman. The seventeen members are : The Director of Agriculture, the Director of Animal Husbandry, a representative of the ICAR, New Delhi; eight members elected by the Court from amongst its members who are not employees of the University or Government, two of whom shall be Chairman of Agriculture Committees of the Zilla Parishads; the three Directors of Instruction, Research and Extension Education of the University; one Dean of a Faculty elected by the Academic Council by rotation; one academic staff member elected by the Academic Council (other than the Directors and the Deans) one eminent Agricultural Scientist, nominated by the State Government. The council had its first meeting on 15.10.69.

Among the various purposes of the University mentioned in the Act the outstanding are ; (i) providing for education in agriculture and allied sciences and humanities; (ii) furthering the advancement of learning and research, in agriculture and allied sciences; (iii) undertaking and guiding extension education programmes for the improvement and development of agriculture in the State; (iv) integrating and coordinating the teaching of subjects in the different faculties of the University and (v) coordinating agricultural education, research and education activities.

A peculiar feature of the University appears to be that in the Act it is mentioned "that the University shall endeavour to promote the use of Marathi as the medium of instruction". Further it is stated that the University shall commence to provide in Marathi within a period of five years the text books for all the subjects in which instruction is imparted and examinations are conducted by the University. But it is not mentioned whether this relates to both Under-graduate and Post-graduate courses.

Three Colleges of Agriculture at Nagpur, Parbhani and Akola and one Veterinary College located at Nagpur, fourteen research stations and 40 research schemes have been transferred

to the control of the University. Extension activities such as development of block under the extension wing is transferred from the State sector to the University.

Although several faculties are contemplated in the Act, at present there are two faculties one for Agriculture and the other for Veterinary Science. The subjects included under each are as follows :

Faculty of Agriculture : Agronomy, Agricultural Chemistry and Soil Science, (2) Agricultural Botany and Plant Breeding; (3) Agricultural Extension, Agricultural Economics and Languages; (4) Plant Pathology and Entomology; (5) Animal Husbandry and Dairying; (6) Agricultural Engineering, Physics, Mathematics and Agricultural Statistics and (7) Horticulture.

Faculty of Veterinary Science : (1) Anatomy, Histology, Embryology, Physiology, Biochemistry and Animal Nutrition; (2) Animal Management, Hygiene, Genetics, Breeding and Extension; (3) Pharmacology, Materia Medica, Toxicology, Clinical Medicine, Preventive Medicine and Veterinary Jurisprudence; (4) Bacteriology, Immunology, Virology, Mycology, Pathology, Food Hygiene, Dairy Science, Meat Inspection, Parasitology, Protozoology, Helminthology and Entomology (5) Surgery, Anaesthesiology and General Systemic Surgery, Animal Reproduction including Animal Gynaecology and Obstetrics.

After the constitution of the University the State Government retained certain powers viz.,

- (i) The power to sanction the financial estimates as given in Sub-section 1, Section 50 of the Act.
- (ii) The power to appoint ministerial staff members carrying total emoluments of Rs. 500/- as given in Statute 55.

The State Government for the year 1969-70 sanctioned a total grant of Rs. 109.83 lakhs, but this is considered not adequate and attempts are being made for enhancement. The ICAR provided Rs. 10,000/- as grants for development and Rs. 1.33 lakhs for coordinated research projects.

All the employees of the University at present are treated as transferred from the Government to the University with a *leave in the Government*. They are reckoned to be on deputation to the University without deputation allowance. The Act provided for the employees to revert back to Government service at their will within a period of two years commencing from 1.6.68.

The working of this Agricultural University is obviously in its infancy and it would take time for organisation and to implement the ambitions programme envisaged.

Maharashtra Agricultural University

The Maharashtra Agricultural University Act of 1967 authorised the function of the university which was formally inaugurated by late Dr. P. V. Cherian, Governor of Maharashtra and Chancellor of the University on 30.6.68. By subsequent ammendment of the Act a part of this university was constituted into Punjabrao Krishi Vidyapeeth at Akola from Otober, 29, 1969.

The Maharashtra Agricultural University is now officially known as *Mahtma Phule Krishi Vidyapeeth* with its headquarters at Poona. The list of colleges affiliated to this university on June 1, 1968 were (i) Agricultural College Poona (ii) Agricultural College Dhulia (iii) Agricultural College Kolhapur (iv) Agricultural College Dapoli and (v) Veterinary College Bombay. Along with these colleges the Government of Maharashtra transferred a number of research stations and part of extension activities to the control of the university. A college of Agricultural Engineering was started from July 1969.

Sri H.G. Patil was the first Vice-Chancellor to assume office and the university is administered by an Executive Council of 19 members with the Vice-Chancellor as the Ex-officio Chairman of the Council and the Registrar of the university as Ex-officio Secretary. The first meeting of the Council was held on 3.6.69. The Government of Maharashtra retained certain powers with regard to the preparation of Financial estimates and for their approval by the Government.

The Government employees allocated to the university are on terms of deputation for two years retaining win in the Government and with an option to revert back to Government according to their choice. The financial position is reported to be very satisfactory with sufficient funds allotted by the State Government and substantial grant form the ICAR New Delhi.

This university in its organisation is being assisted by Pennsylvania State University (USA) under the USAID Programme. Its role as an agent of change is yet to be established, nevertheless, the new university set up as provided

by the State legislative action has already stimulated cooperative effort between the personnel of existing agricultural colleges and State department of agriculture.

Assam Agricultural University

The Assam Agricultural University came into being on 1.4.1969, with the main campus at the College of Agriculture Jorhat and the other at Gauhati where the College of Veterinary Science was located. Both the Colleges have undergraduate and postgraduate programmes; the Agricultural College having four departments for postgraduate work and the Veterinary College five departments. The university was patterned on Land-grant college model of USA where teaching research and extension are intergrated. For both undergraduate and postgraduate courses the trimester system is followed.

Dr. S.R. Barooah was named as the first Vice-Chancellor. The university is administered by a board of management consisting of 17 members. Under USAID collaboration programme the university receives technical assistance from Missouri State University USA. Other agencies like the FAO and UNESCO have also offered liberal assistance.

A unique feature of the university is in that it serves the needs of a vast underdeveloped hill region covering Assam, NEFA, Nagaland, Manipur, Tripura, Sikkim and Bhutan. Students from all these areas are trained in various programmes with a view to attain integrated development of agriculture and allied fields in the North Eastern region of the country. Adjoining states of Sikkim and Bhutan derive significant benefit from the university. This is the only university where Tea Science is being taught at undergraduate and postgraduate levels.

The state government has transferred the research complex at Jorhat to the administration of the university where a central agricultural research station is being developed for research on various crops in an area of 200 acres. A central research station for veterinary and live-stock is being developed at Gauhati with the assistance of ICAR and USAID. The university has taken up extension education programme only in specific areas and the teaching staff are involved in it.

The first convocation was held on 7th December 1969 when

graduates in Agriculture Veterinary Science received their degrees. A master plan has been prepared for the next fifteen years, for the two campuses at Jorhat and Gauhati where construction work for the different buildings will soon start. It is also proposed to have colleges for Home Science, Forestry and soil Conservation, Basic Sciences and Humanities and Agricultural Engineering.

Some Growth Problems

Each Agricultural University has tried its own experiments and innovations to deal with the curricular, co-curricular, research, extension, administration, student and staff matters.

Although all these universities possess the freedom to innovate, their efforts have not followed a rigid pattern. The label of an agricultural university does not therefore connote the nature and extent of innovations made or the value thereof. Energetic and forward-looking leadership with motivation and capability for initiating and seeing through the innovative process may not be available in all cases. It is not therefore surprising if a few of the universities remain virtually indistinguishable from the traditional universities. The problems of transition and adjustment to their new status and responsibilities, which may partly be their own creations, become rather formidable in such cases.

Almost all the Agricultural Universities with the singular exception of UPAU are in reality "arranged marriages for mutual adjustments over time". In other words an agricultural University resulted from a combination of Government bureaucracy inherited from the departments and institutions taken over, to be run on University autonomy a situation that can be highly explosive unless bureaucracy is jettisoned and autonomy is jealously guarded. The difficulties in the formative period cannot be oversimplified as teething troubles but very frequently they posed a great threat to the sincere endeavours shown by both the Indian and American specialists at work. Fortunately, as is the case with Indian marriages, over a short spell of time dark clouds of distrust cleared off; a fertile ground appeared for seeding the new concept; necessity, faith and optimism the essential nutrients added in sufficiency, enabled the seed to germinate and root firmly. In a few cases phenomenal growth

and rich harvest of the fruit appeared in some measure of abundance to assure the soundness and realibility of the Land Grant College philosophy.

Major Land-Grant Universities in America are now a hundred years old and most of them have experienced many of the same kinds of growth problems, Indian Universities face now. Accomplishments of the Indian institutions in the last ten years compare favourably with what most American institutions were able to achieve in a much longer period.

Tamil Nadu Agricultural University

The Tamil Nadu Agricultural University Act of the Legislature received assent of the Governor on April 25, 1971. Through a Gazette notification the University came into existence on June 1, 1971 when Dr. G. Rangaswami assumed office as its first Vice-Chancellor.

The objectives of the University, as defined in the Act are : (a) to impart education in different branches of agriculture and allied sciences as the university may determine ; (b) to further the advancement of learning and prosecution of research in agriculture and allied sciences, and (c) to undertake the extension of such sciences to the rural people in co-operation with the concerned Government departments. For this purpose 'agriculture' has been defined to mean the basic and applied sciences of the soil and water management, crop production including production of all garden crops, control of plants, pests and diseases, horticulture including floriculture, animal husbandry including veterinary and dairy science, fisheries, forestry including farm forestry, home science, agricultural engineering and technology marketing and processing of agricultural and animal husbandry products, co-operation, land use and management and the economic and social uplift of the rural people.

The Governor of Tamil Nadu is the Chancellor and the Minister for Agriculture is the Pro-Chancellor of the University. The administrative authority of the University is the Board of Management with Vice-Chancellor as its Chairman. The Board consists of 6 ex-officio members viz., Secretaries to Government Departments, of Agriculture and Finance, Directors of Agriculture, Animal Husbandry and Fisheries, and Chief Conservator

of Forests. The nine members nominated by the Chancellor come under the category (a) agricultural scientist, (b) crop farmer, (c) livestock farmer, (d) agro-industrialist, (e) woman social worker, (f) educationist and (g) representative of the Indian Council of Agricultural Research, plus one elected member of the Legislative Assembly and another of the Legislative Council. The Registrar is the ex-officio Secretary of the board.

The Academic Council consists of the Vice-Chancellor as its Chairman, the Secretary to Government, Agriculture Department, Deans of the colleges, Deans of all faculties, Director of Research, Director of Extension Education, six members from among the Heads of Departments nominated by the Vice-Chancellor on a rotational basis, three persons having special knowledge or practical experience in different aspects of agriculture to be nominated by the Vice-Chancellor, as members. The Registrar is the ex-officio Secretary.

Besides the Academic Council, there is provision for organizing Board of Studies for each of the faculties of the University. To begin with the University shall include Faculties of Agriculture, Basic Sciences, Agricultural Engineering, Animal Science, Home Science, Forestry and Fisheries. The State Government transferred to the University on June 1, 1971, the Agricultural College and Research Institute, Coimbatore, the Agricultural College, Madurai, the Agricultural Research Stations at Bhavanisagar and Aliyarnagar, the Groundnut Research Station, Pollachi, the Apple Research Station, Kodaikanal, and the Fruit Research Station, Periakulam. These institutions are within the boundaries of the districts of Coimbatore and Madurai. Along with these institutions a total of 35 research projects financed by either Central or State Government or USAID, PL 480 programmes have been handed over to the University by the State Government. The transfer of all the educational and research institutions falling under the gambit of the Act, to the control of the University is expected in due course.

The State Government, as per the provisions of the Act, shall grant not less than the net expenditure incurred in the year relating to the activities of the institutions transferred to the University. The institutions so far transferred to the University shall receive an annual grant of Rs. 183 lakhs. There

is provision for meeting the expenditure by the State Government on account of the University office and staff, and on approved items of expenditure on development of the University.

11. Some Accomplishments of the Agricultural Universities

The dynamic social and economic changes in Indian life during the past few years have forced the colleges to make critical self-assessment. When everywhere the urge was for growth, flux and ferment, the agricultural institutions could not stand isolated for *status quo* or stability. When the country with its agriculture was hurrying into the future, it required the agricultural institutions also to hurry along with it. They are expected to pass the tests of utility and value as service-oriented institutions. A hope of flamboyant self-assurance had no place. Men and women turned out by the packaging of mediaeval curriculum in the stereo-typed college were not answering all the demands of the changing times. They lacked the will to achieve higher standards of excellence and of learning and were unprepared to serve the people with enthusiasm and dedication. Stirrings of dissatisfaction and reform were apparent and soon became a movement to shift emphasis from the traditional course of study to something more meaningful and useful for contemporary life. The efforts in 1960 were therefore directed towards revolutionary reorganisation of agricultural education, research and extension through the agricultural university concept.

All the agricultural universities, with the exception of UP Agricultural University are only parts of the erstwhile departments of agriculture and animal husbandry carved out and integrated to align to the pattern of the Land Grant Colleges of USA. The old wine thus set in a new bottle under the influence of new organisation and environment gave a superior flavour. The flavour of certain wines has been so conspicuously pleasant as to deserve a special record here as the notable achievements. This may illustrate how the same scientific personnel and institutions of the past, under a

different set-up and drive and with a new philosophy and motivation could be highly productive. It also signifies that the new concept of integrated functions is tending to root firmly in the Indian soil with prospects of healthy growth. The material of this chapter has been limited to only certain outstanding features representative of the different aspects of work of Agricultural Universities over a short spell of time; eliminating repetition of what was described in an earlier chapter relating to each of the agricultural universities.

Education—Faculty Reformation

If it is accepted that development of agriculture in an under developed country or one that is facing chronic food shortages over years, can only be achieved through an application of the results of modern science and technology. It follows that improved techniques must replace the less efficient ones, new tools must be used in place of the old. To this end, a country must press into service an uninterrupted flow of trained men of calibre and devotion from well-equipped educational institutions manned by an energetic and experienced faculty. Such faculties must be so manned to maintain a high sense of contentment, instil enthusiasm and encouragement to the deserved, and to reward the outstanding. Faculties can never be built on the basis of supply and demand with low paid, under qualified and motivation-free individuals like a factory or mill. The university has to be as firm on qualifications as on salaries. These are precisely the aims of all Agricultural Universities and some have been able to achieve the objective.

Equally firm the university has to be in its policy of weaning away the teachers from the temptations of extraneous assignments carrying remuneration and seriously dislocating legitimate work. Some of the Agricultural Universities have accordingly banned the acceptance of external examinations by their faculty members.

Another rampant evil in Indian colleges of agricultural sciences, was the large size of classes. Increased enrolments were the result of political or administrative decisions, taken without any regard to the availability of classroom or hostel accommodation or the adequacy of laboratory equipment or teaching staff strength. A comparison of staff strength as per-

ween the colleges prior to 1960 would reveal a chaotic pattern. Whereas in one college the class was so big in 1964 that two to three batches had to be formed for practical classes in the laboratory or field, the staff strength remained practically the same in this college as in the other where only one batch had to be dealt with. Both these colleges are currently constituent colleges of an agricultural university with identical teacher-student ratio.

Universities that provide for additional full professor positions in a department appear to have an organizational pattern that gives staff members an incentive to grow and work. It also helps to prevent fragmenting departmental sections into additional departments. Some agricultural universities have already provided for multiple professorships.

As an institution of higher learning every university and college should always mirror faithfully the best in the State's character and capacity. The good effect of a judicious appointment is inestimable. The good is penetrating and diffusive. The mode of securing the best persons for the faculty should be such as to ensure perfect impartiality. If the selection is based on merit, the stimulus to intellectual cultivation would be greatly increased, and the honour of an academical appointment immeasurably augmented. The system of selection by experts from outside the institution is probably the best method which could be devised. If the selection is left to the Boards, with no deep interest in education, they are liable to influence from ulterior motives, either sectarian, personal or political or parochial. With the autonomy enjoyed by most of the agricultural universities, the recruitment to the faculty has improved considerably judged from the sporadic errors, to secure persons with better talents and dedication. It is difficult to say that all *agricultural universities* have perfected their systems of recruitment to secure only persons of talent and dedication.

The development of a sound and energetic faculty being the major key to a successful university, the agricultural universities have to adopt and follow very carefully worked out plans and procedures to build this vital part. In one University the terms and conditions of transfer of the staff were discussed in detail prior to the transfer.

The recruitment and selection procedures prescribed in the statutes of this university further helped to weed out the unsuit-

per cent of students on academic probation, per cent of students removed from rolls of the university due to poor academic performance and the per cent of students classed under "Merit certificate" (securing an OGPA of 4.25 and above out of 5). The Vice-Chancellor, Uttar Pradesh Agricultural University in his convocation address on March, 14, 1970 referred to the significant rise in academic standards in education, on the basis of the said indices. He reports that the percentage of students, who remained on 'Academic Probation' fell by 3.6% from 16.6% in 1967-68 to 13% in 1968-69, the corresponding figure for 1965-66 being 21.1%. The number of students, who had to be dropped from the University on account of poor academic performance, registered a further fall, being 1.2% as against 1.8% in 1967-68, 2.9% in 1966-67 and 4.5% in 1965-66. Further, 12% students received the University and College Merit certificates (for having secured an overall Grade Point Average of 4.25 and above out of 5.00) in 1968-69 as against 9.7% in 1967-68, 8.7% in 1966-67 and 5.6% in 1965-66. It is a tribute to the new system of education that 85 to 90 per cent students can secure graduation under normal conditions, and that the academic waste is very much lower than that under the traditional system. The average wastage calculated on the basis of the results of all the faculties for all the years available so far works out to 11%, a striking contrast to the situation in traditional Universities in this respect.

The UAS Bangalore has set a fine example of a reorganisation of the faculty whereby a refreshing and rewarding contrast from what was existing prior to the university set up was achieved. If it is conceded that universities attract students on the basis of their academic reputation and the promise they hold out in providing intellectual stimulus and that these in turn depend on the scientific stature of the teaching staff, a comparison of the facts before and after the ushering of the Agricultural University in Mysore state is most revealing. A University in its working must be conscious of the norms set to gauge the direction and progress it is making towards maturity.

BEFORE AND AFTER THE UAS SET UP

**

1965-66 As on
1.1.1970

1. No. of teachers (Rs. 1,000 and above scale)	In teaching research and extension.	0	19
2. No. of teachers (Rs. 400 and above scale)		19	201
3. No. of teachers (Rs. 200 and above scale)		27	350
4. No. of teachers (Rs. 200 and less scale)		163	—
5. No. of Ph.D. degree holders		19	52
6. No. of M.Sc. degree holders		102	265
7. No. of first degree holders		88	253
8. No. of persons engaged mainly in teaching		90	286
9. Teacher-student ratio (teaching only)	In institutions transferred to UAS and later established by the UAS.	1:14.4	1:6.37
10. No. of persons engaged in research		119	254
11. No. of persons engaged in both		—*	540
12. No. of persons engaged in extension education		—	30

†Library Stocks (Univ. Library)

1965-66 As on
31.3.1970

1. Books	15,000	42,567
	(Approximate)	
2. Periodicals	137	901

*In institutions transferred to the UAS, research and teaching were not integrated till the date of transfer, although a few scientists were ex-officio teachers.

**Page 6. Quinquennium in Retrospect by Dr. K. C. Naik.

†Page 7. Quinquennium in Retrospect by Dr. K. C. Naik.

Library—the Old and the New

The Library is the most important tool of education in a modern educational institution. It is the very first necessity, the life and spirit of a university. Comparatively little attention and money have been devoted to the library at the time of establishment of most institutions in India.

The use of reading material is an integral and indispensable part of the educational process. Yet, before the agricultural universities were established, it was customary for professors in many colleges to have their own sectional libraries while the student libraries had an indifferent collection of books with few, if any, worthwhile journals or periodicals. Even these inadequately equipped libraries were not readily accessible to student use, because the books were kept under lock and key, and released to students only on specific request to the librarian. This inhibited the free and informal, browsing among the books which alone can help to meet the students' appetite for further reading. Often, these libraries were kept open almost precisely when the students were engaged in classes.

The agricultural universities have realised their responsibilities to the students to make all except the rare books easily accessible. The locks are no longer there in almost all libraries and open shelves are now the rule in all institutions. The libraries are also now kept open during the hours when students are not engaged in classes. More roomy clean and orderly libraries have been established or the old libraries improved and enlarged to become well lighted and ventilated and provided with enough reading seats. The number of books and periodicals are also being increased rapidly. Qualified and competent librarians have been appointed in most of the agricultural universities. The teachers are also required to stimulate reading habit among the students and make students to do library work as a direct part of their course of study. Experience has shown that by these newer teaching methods and by the introduction of semester or trimester system and internal evaluation, students are making significant use of libraries, so much so that in certain agricultural universities, sizable alteration in library facilities had to be made several times in the course of the first two years of switch over from the traditional methods of teaching to the present methods.

New modern libraries are being or have been established with provisions for services such as duplication, microfilming and similar functions. Almost all the agricultural universities have had substantial grants for accession of the books and subscribing for the Indian and foreign periodicals. The change during the short interval is phenomenal and can be regarded as a worthy accomplishment and of incalculable benefit for the present and future.

BOOKS AND JOURNALS AT THE LIBRARIES OF AGRICULTURAL UNIVERSITIES AS ON 1.4.70

University	Books	Journals
IARI New Delhi	2,00,000	1,800
UPAU Pantnagar	83,623	1,210
PAU Ludhiana	65,449	1,000
UAS Bangalore	42,567	901
APAU Hyderabad	40,342	320
JNKVV Jabalpur	15,315	350
HAU Hissar	50,000	850
OUAT Bhubaneswar	77,000	200
Kalyani W, Bengal	40,539	120
Udaipur Central library	41,334	278
AAU Jorhat	12,010	520

Crop Improvement Programmes

The focal point of the agricultural university concept is the integration of teaching, research and extension. Currently in all the agricultural universities integration of teaching and research has largely been achieved. The necessity of teaching and research to go hand in hand has been universally recognised for a variety of valid reasons including prudence. The new patterns of research in agriculture described elsewhere recognise the establishment of regional research stations representative of agro-climate and cropping patterns and (ii) Inter-disciplinary approach to solve agricultural problems. In addition to the fundamental problem-solving research carried on at the main centre or centres of the experiment stations, adaptive research

is carried on in the State as needed to learn how the principles should be worked into combinations of practices with various kinds of soil, crops, and animals in management systems.

For the country as a whole coordinated programme of research for crop improvement with inter-disciplinary research as the basis, the ICAR has done commendable work with the cooperation of the agricultural universities. All Agricultural Universities without exception have now some coordinated crop improvement programmes financed by the ICAR, besides similar research in other fields of agricultural sciences.

International Collaboration

A recent trend of international collaboration in research, through the generous technical and financial aid of Rockefeller and Ford Foundations, has resulted in remarkable benefit in the field of crop improvement in many of the developing countries including India. This may be well illustrated in the case of two major food crops of India—rice and wheat.

Rice :—In improvement of this crop, the approach was mainly one of plant introduction—Rice from Philippines and wheat from Mexico. The new crop varieties thus introduced for adaptability into cultivation in India possessed qualities to by-pass the erstwhile yield barriers. Thus plant type concept founded at IRRI Philippines gave varieties of short stature, profuse tillering, better capacity for use of solar energy and added fertilizer photo insensitiveness—all conducive for higher yield. Except for sporadic cases the introduced varieties failed primarily due to lack of resistance to diseases and pests. However, the material served well for hybridisation with local varieties to induce such of the characters that augmented the yield components.

An All-India Coordinated Rice Improvement (AICRI)* project was initiated in 1965 and its nation wide cooperative work resulted in the release of new high yielding dwarf rice varieties *Jaya* and *Padma*. These have now gained wide acceptance and the coverage on farmers lands is indeed very fast. Dr. S.V.S. Shastri who primarily was responsible for

*Project with its headquarters at Hyderabad (AP) is largely financed and technically supported by the Rockefeller Foundation.

20

INDIA

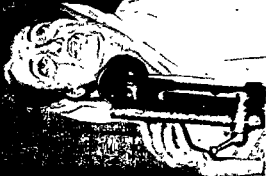
WHEAT REVOLUTION

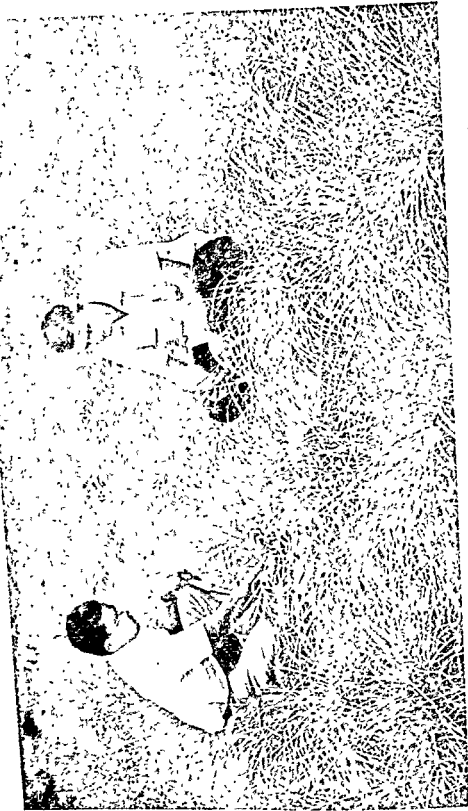
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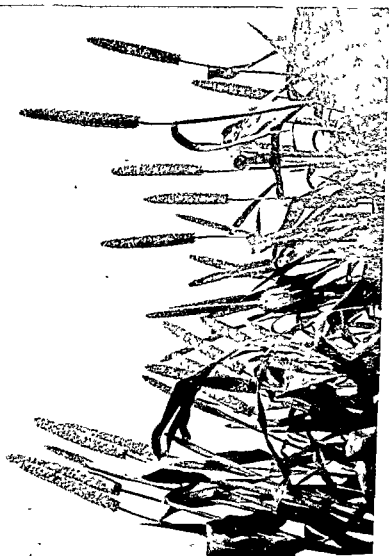


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APAU , Rajendranagar—Grassland Project in cooperation with USAID and Kansas State Univ.
Picture shows Mr. Robert J. Raney, Irrigation Advisor (right) and Mr. Hanumantha Rao, Indian counterpart





Hybrid Sorghum (Jowar) CSH-1 product of adaptive research by Indian scientists

the variety *Jaya*—a cross made TN-1 \times T-141 while working at Pusa in Bihar, currently works as the head of the AICRI Project.

Wheat :—With the understanding of the factors limiting wheat yields in India, introduction of Mexican wheats for which Dr. Norman E. Borlaug at Mexico was the chief architect, a new era of wheat improvement began in India. The varieties brought from Mexico were studied in detail and genetic technology developed by the scientists at work at IARI, Ludhiana and Pantnagar gave dwarf high yielding wheats suitable for the Indian soil and the climate. The various aspects of hybridisation, progeny testing and large scale field trials involved a host of Indian scientists at the different agricultural universities.

In Punjab Dr. Athwal selected from among the thousands of Mexican wheat breeding lines imported to India towards the end of 1963, the promising PV 18 which yielded in the 1966 harvest 2.5 to 3 tons an acre against the Punjab average of 1100 lbs. per acre. This was a red-seeded wheat while Punjab's preference was for an amber-coloured grain. Dr. Athwal found a sister dwarf line with the amber-coloured seed possessing the high yield and disease resistance qualities of PV 18. This strain he named as Kalyan 227. By the summer of 1968, this new wheat was expected to cover all the wheat acres in Punjab, an achievement of which Dr. Athwal and Punjab Agricultural University could legitimately be proud of.

With the discovery of three genes for dwarfing in wheat varieties, several such wheat strains called 'Triple Dwarfs' have been evolved and are currently in advanced stages of testing. From UPAU the release of UP 301—three gene dwarf wheat marks an important milestone in the history of wheat improvement.

Just within a period of five years, no less than 12 million acres under assured water supply is devoted to cultivation of new dwarf wheats. The national output of this cereal is of the order of 17 to 20 million tons. This achievement, an all time record, was made possible through the generous assistance of Rockefeller and Ford foundations. Dr. M.S. Swaminathan, Director of the Indian Agricultural Research Institute has played a major role in wheat improvement programme. The Government

of India celebrated the work of all those Indians who contributed to the success of wheat production upsurge when it issued a special "Wheat Revolution" stamp, presented by the Prime Minister, Mrs. Indira Gandhi, in a ceremony commemorating the unprecedented bumper wheat harvest of 1968.

Sorghum and Pearl Millet

The development and release of the first Sorghum hybrids CSH-1 and CSH-2 during 1964 and 1965 respectively and the release of a true breeding variety *Swarna* in 1968 provided the material basis for the high yielding varieties programme pertaining to Sorghum. With increased yields of the order of 60 to 100% over the local and maximum yields of 6,000 to 7,000 Kgs/ha under optimal conditions of cultivation the first hybrid marked a genetic breakthrough in the yield levels.

A coordinated research programme on Sorghum has been set on foot with the technical assistance of Rockefeller Foundation; a worthy example of International collaboration in crop improvement in a developing country. However, it must be mentioned that it was largely the Indian effort under the leadership of Dr. N. Ganga Prasada Rao, the project coordinator for Sorghum crop improvement.

The work on pearl millet (*bajra*) was equally exciting when Dr. D.S. Athwal of Punjab Agricultural University combined Tift 23A with one of his own good lines BIL-3B and captured an outstanding hybrid HB-1 (Hybrid bajra-1) by far the best pearl millet that India had ever seen. On trial at 20 different locations its performance was outstanding even under record drought. Later work, resulted in the release of HB-2, HB-3, and HB-4.

More recently two events have occurred which Indian millet breeders feel are momentous. The first is that Dr. Athwal and his associates have found additional sources of male sterility thereby giving genetic variability to their breeding materials and opening "new vistas for nearly unlimited progress" in pearl millet breeding. The second is the development of dwarf hybrids.

Machine Age

The Punjab farmer is very much machine minded since

a long time. Currently, the state can be ranked first in mechanised farming and this has largely been due to the sustained efforts of the department of engineering of the Punjab Agricultural University. Recent innovations are of particular interest even to farmers of other states. Thus the development of a groundnut-digger-shaker, by one of the Engineers at Ludhiana is an achievement of considerable worth. The proto-type of this implement has been found to be very efficient. It not only results in saving of labour but will go a long way in double-cropping the area in the groundnut belt. Similarly, a very efficient potato-digger has been developed. This machine does not bruise the tubers and the harvested crop is deposited in a wind-row of about 40 cm, width. This machine will eliminate one of the most labour-intensive operations in crop production.

A wheat reaper has been designed to be drawn by a pair of bullocks. This is claimed to perform the operation at about 60% of the cost now incurred with manual labour.

Multiple Cropping

This is a very potent instrument for improving the economic positions of a farmer with a small holding. Studies in the Agricultural Economics Department of Punjab Agricultural University have clearly shown that the employment potential of agriculture can be greatly enhanced by double cropping in lands with irrigation facilities. Further, it was shown that in the Ludhiana District, there has been an appreciable increase in real income among all classes of farmers, big, medium and small, as well as among landless labour. This is not true in many other IADP districts where the farming technology has not become as advanced as here. In as much as 69 per cent of our work-force will depend upon agriculture for employment even by 1981, the social significance of technological upgrading of the employment potential of our cropping systems is obvious.

Another example of this kind is from Andhra Pradesh. From a recent meticulous survey of the IADP in* progress in West Godavari district, it is seen that far reaching benefits to farmers are assured if the programme is accelerated on specific

* Ford Foundation Report on "Accelerating Development in West Godavari District May, 1969".

lines suggested. The success of the programme has largely been due to collaborative efforts of APAU and State Department of Agriculture with the generous support of the Ford Foundation.

Problems of Dry Farming

In Mysore State where approximately 90% of the cultivated area is dependent for farming on rainfall, the problems of crop production are highly complex requiring a long range pragmatic Plan. The UAS which came into being in 1965 is more than aware of this and hence patterned its programmes and activities not merely to train students for a degree but rather to serve as the dependable service station for the whole state of Mysore in the field of agricultural sciences.

This University of Agricultural Sciences has given considerable thought and attention to the development of research on drought and rainfed agriculture as a whole. Of the 18 crop varieties released by this University 10 of them are designed for the uplift of rainfed farming. Research has now been oriented to render the crops and crop-growing practices in rainfed areas more dependable. The University has contemplated the establishment of a main centre for research on rainfed agriculture at the Gandhi Krishi Vignana Kendra (New Campus of the UAS).

A study of underground water resources in the problem areas was undertaken by the university in collaboration with OXFAM in three districts of the State in January 1969. The main objective was to find out the water table, recuperative capacity and seasonal variations in supply in these areas, so that a programme of well-sinking through mobile rigs could be finalised. The study covered 73 villages and 230 wells in three districts. The recuperative capacity of most of these wells was found inadequate. Since the survey revealed that the surface wells did not provide adequate quantities of water, OXFAM initiated a well-boring programme in the area.

Pasture Renovation and Sheep Improvement

Few projects of work initiated in recent times in the field of animal husbandry had such practical and laudable objects as the one on grass land improvement, under the joint auspices of the KSU—USAID and the APAU. This project which com-

menced work in April 1968 at the main campus of APAU at Rajendranagar (Hyderabad) has for its object, to enhance hay yield and carrying capacity through better management practices, such as removal of competitive brush, reseeding with more nutritious grass types and fertilization.

A spectacular result of this has been an increase from 58 tons to 83 tons of hay in the first year of its enclosure, from an area of 100 acres harvested for hay making. In the second year from a similar acreage an estimated yield of 197 tons is expected.

The results of grazing experiments in the first year indicate that the animals grazing under natural conditions at maximum nutritive value gained 0.3 kg. of weight per day while the animals at maturity on cut and feed treatment decreased in weight.

"Earn While You Learn" Poultry and Pig Projects are providing practical experience and income for sizable groups of students each year at the Veterinary colleges of Andhra Pradesh Agricultural University, and there is an increasing tendency at most agricultural universities toward greater specialization in the different branches of animal science, which could lead, as it has already in a few instances, to the academic separation of animal husbandry and dairying have progressed much further than meat animal production, for obvious reasons, and this trend is likely to continue. The most hopeful indications of improvement in the livestock situation are to be found at the agricultural universities; with a little more financial support and encouragement they could establish themselves in perhaps a decade as effective agents of change in this area. Once significant changes get underway, India's vast potentials in all aspects of the livestock industries will begin to be realized.

The Sheep Improvement Project of Hissar (Haryana Agricultural University) is commendable in several ways. Under technical assistance programme the biggest air lift of Corriedale breed of sheep from Australia is expected to give necessary stock for the improvement of local sheep both for mutton and wool production. The average Corriedale sheep provides about 10 lb. of wool annually as against 2 lb. for the average Indian sheep. The experimental results of this project are of great interest to States of Rajasthan and Mysore.



Hybrid Sorghum (Jowar) CSH-1 product of adaptive research by Indian scientists

the variety *Jaya*—a cross made TN-1 \times T-141 while working at Pusa in Bihar, currently works as the head of the AICRI Project.

Wheat:—With the understanding of the factors limiting wheat yields in India, introduction of Mexican wheats for which Dr. Norman E. Borlaug at Mexico was the chief architect, a new era of wheat improvement began in India. The varieties brought from Mexico were studied in detail and genetic technology developed by the scientists at work at IARI, Ludhiana and Pantnagar gave dwarf high yielding wheats suitable for the Indian soil and the climate. The various aspects of hybridisation, progeny testing and large scale field trials involved a host of Indian scientists at the different agricultural universities.

In Punjab Dr. Athwal selected from among the thousands of Mexican wheat breeding lines imported to India towards the end of 1963, the promising PV 18 which yielded in the 1966 harvest 2.5 to 3 tons an acre against the Punjab average of 1100 lbs. per acre. This was a red-seeded wheat while Punjab's preference was for an amber-coloured grain. Dr. Athwal found a sister dwarf line with the amber-coloured seed possessing the high yield and disease resistance qualities of PV 18. This strain he named as Kalyan 227. By the summer of 1968, this new wheat was expected to cover all the wheat acres in Punjab, an achievement of which Dr. Athwal and Punjab Agricultural University could legitimately be proud of.

With the discovery of three genes for dwarfing in wheat varieties, several such wheat strains called 'Triple Dwarfs' have been evolved and are currently in advanced stages of testing. From UPAU the release of UP 301—three gene dwarf wheat marks an important milestone in the history of wheat improvement.

Just within a period of five years, no less than 12 million acres under assured water supply is devoted to cultivation of new dwarf wheats. The national output of this cereal is of the order of 17 to 20 million tons. This achievement, an all time record, was made possible through the generous assistance of Rockefeller and Ford foundations. Dr. M.S. Swaminathan, Director of the Indian Agricultural Research Institute has played a major role in wheat improvement programme. The Government

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Campus Development

Physical facilities by way of campus development, open system of libraries, better living conditions in the hostel, and provision of modern recreational centres have been created in a short period of time. In some cases these efforts have been unprecedented both in size and quality. In the book on *Campus Design in India* by Achyut Kanvinde and H. James Miller*, it is recorded that the site for the main campus "is one of the most inspirational in India" and the Campus Development Committee of the University "has been doing an admirable job". This undoubtedly is an example of a university with a clear vision of its needs, hopes, and aspirations in the coming period of 30 years as evidenced by the phased programme of development drawn.**

Home Science at its Infancy:—In any consideration of accomplishments of agricultural universities as agents of change reference should be made to Home Science. Dr. Weber† in a recent survey of the agricultural universities in India observed that neither the USAID nor the Government of India has recognised the importance of home science as an academic discipline. But even so, progress is being made in developing this discipline at some of the agricultural universities and there is a growing inclination to take rural women and home scientists into account in balanced assessments of agricultural development. Another indication of the increased attention being given to home science is the fact that the first American graduate student to work in India under any of the AID-University contract programmes collected data at an Indian hospital for her doctoral thesis on the nutrition of pregnant women. She worked under the supervision of KSU-AID Home Science advisors at the APAU, Hyderabad. These accomplishments have to be regarded only as preparatory nature and in the long

**Campus Design in India*—by Messrs. Achyut Kanvinde and H. James Miller.

**Inauguration of the Gandhi Krishi Vignana Kendra, July 12, 1969, UAS, Bangalore. (Page 20—21).

†Dr. Arthur Weber—*The Agricultural universities as agents of change. Food production and Income distribution in South—Asia. The double dilemma South Asia centre Pub. 1 September, 1969. Kansas State University, Kansas (USA).*

enlarged the scope of gainful employment to the graduates. Student participation in many of the academic activities of the university has been made possible. The appointment of a separate Dean for student welfare and the starting of student information Bureau at some of the campuses clearly mirror the deep interest evinced by the faculty in student affairs. The provision made at UPAU to subsidise up to 50% of the cost of text books purchased by the students during their training is indeed a useful achievement.

Extension—a Limited Success

An agricultural university which combines teaching, research and extension in one public service function cannot gain public support and achieve financial stability if its extension function is weak. Studies on current operating expenditures by functions (instruction, research and extension) in some colleges of agriculture (USA) clearly indicated significantly higher allocations to extension, as each college of agriculture is dedicated to the belief that "knowledge will serve people". Earlier it was recorded there has not been so far a single university in India which has successfully integrated the functions of extension into its fold on a State-wide basis. The phased programme is too slow and yet some notable achievements have been accomplished. Thus, the UAS Bangalore, undertook certain projects in the line to meet the food deficit in the State of Mysore. The USAID Advisor on Extension, the OXFAM and the University jointly developed a programme which provided for the import of fertilisers to India by OXFAM, for large-scale popularization of hybrid maize in an area enjoying assured irrigation facilities. Fertilisers were in very short supply at the time, while the foreign exchange resources of the Government of India were difficult. The offer of the OXFAM in 1966 to supply 5,300 tons of fertilisers on rupee payment was, therefore, timely and most welcome. It was thought that every ton of fertiliser could help to yield more than five tons or more of food within the country in a matter of a few months. The fertilisers were sold to the farmers at controlled rates, and high-yielding short duration crops like hybrid maize were raised over about 10,000 acres of land in the Tungabhadra Project (TBP) area of Mysore State during January and February 1966.

This is the area which has over 400,000 acres under assured irrigation.

By the end of September 1966, over 13,700 acres of hybrid crops were raised in the TBP area and also to a smaller extent around Bangalore. This consisted of about 8,200 acres of hybrid maize, 5,300 acres of hybrid jowar (*sorghum*) and 200 acres of hybrid bajra (*Pennisetum*)—all noted for their high-yielding potentialities. All these achievements occurred in less than eight months. The success of this programme was possible not only due to the speedy supply of the fertilisers by OXFAM but also due to the success of the university in securing adequate quantities of hybrid seeds from Rajasthan, Hyderabad and from different areas within the State. The National Seed Corporation also helped in this regard.

But for the OXFAM-supported programme the spread of hybrid maize in TBP area would not have been easy or possible within a measurable period of time. The programme also brought out possibilities of pushing up the yields in black soil areas of Tungabhadra. This work has since developed into a very successful pilot project in operation in Bangalore district with a party of 11 extension guides each supplied with a motor bicycle under the guidance of a leader moving with jeep. This project was financed for three years by USAID-Tennessee Team.

The extension education activities of the Punjab University have kept pace with the tremendous progress in plant breeding. Organising refresher and inservice courses for the service personnel of all categories connected with agriculture the extension department has tried to convey promptly the newly emerging knowledge to the farmers. Practical education to farmers was another noteworthy feature and impressive meeting of the farmers held during the wheat harvest seasons are indeed most memorable events.

Despite certain discouraging factors all the agricultural universities have carried out some impressive extension work. The fact must be underlined that this important segment under dual agencies and divided responsibilities between the agricultural universities and the erstwhile State Departments of agriculture would remain static. Unless a determined effort is made to integrate extension with agricultural universities the experi-

mental results cannot reach the farmer's field, and the farmer's problems may continue to baffle him for ever.

Public Support—Essential for Growth

All agricultural universities are service-oriented institutions and the extent of the public support they gain for financial assistance from the Governmental and other agencies would be in direct proportion to the service they render. To this end, the internal strength of the University plays a vital role and this broadly relates to the healthy conduct of the Board of regents, and the cordial and respectable relations between the faculty and the university. That these aspects are well displayed by UPAU Pantnagar and the UAS, Bangalore is a matter of considerable pride.

In his convocation address in March 14, 1970 the Vice-Chancellor UPAU recorded "that the Board of Management directed the affairs of the University with ability and devotion. That all the resolutions of the Board were passed unanimously and there was not a single occasion for a recourse to voting, is a tribute to the unity of interests, purpose and outlook of the Board". That the university's growth towards maturity is assured goes without saying.

In Mysore State the public, as represented in the Board of Regents, have come to feel more and more directly concerned in the promotion of the reform. A proof of this was furnished by the unanimous support extended by ten of the eleven non-official members of the Board in a memorandum submitted to the Chief Minister, Finance Minister and the Minister for Agriculture and Sericulture of Mysore State, reiterating their earlier demand for substantially increased financial support to the University from the State Government. The eleventh non-official member was not available at the time. This powerful and spontaneous support is the most heartening evidence of the fact that this University is already being recognised as a people's University, and a demonstration of the resolute and constant support which the people are bringing to the University's work.

A critical impartial analysis has shown that where a particular innovation or achievement is outstanding, it is the work of a trained scientist put in the right place a vigorous and healthy environment and an aggressive leadership. In all other situa-

tions it is a mere march of the calendar days. The promise held out by the achievements is *encouraging but to escalate this* all over the country is a task of a immense magnitude.

The doubters and detractors notwithstanding, these innovating institutions have made an impact on the Indian scene. They have done more than increase the quantity; they have promoted quality. Their success according to some standards might be small but weighed against the tremendous difficulties they had to contend with, it should appear as significant. Doing their work faithfully and with pre-severance, they are bound to ultimately prevail and commend themselves and their work to the public. It is only by the public affection and respect can these institutions be upheld, while the loyalty of their faculty members and students gives them strength and courage. Many of these universities, if not all, have already acquired the two great assets, prestige and public confidence, but these will not last without adequate financial support.

Exactly half a decade's time is too short for a process of total revolutionary transformation yet the warning is that every second of it is precious for something to be done with the spirit of the axiom "Don't be fooled by the calendar. There are only as many days in the year as you make use of. One man gets only a week's value of a year, while another man gets a full year's value out of a week."

12. *Association of Agricultural Universities*

UNIVERSITIES are part of the international world of science and scholarship. They measure their prestige and status by what men in other universities and educationists and scientists in other countries think of them.

Association of Land Grant Colleges

In the US agricultural universities (Land Grant Colleges and Universities) have had unprecedented growth and are associated with tremendous advance of science and technology with great agricultural and industrial progress. Their prestige and status were built up not by regulation and dictation but by self-realisation of the role of public service and by close association with sister institutions having similar objectives. The American Association of Land Grant Colleges provides a valuable forum for discussion on mutual problems and to work out satisfactory solutions to them. This pooling of their professional and technical resources developed about ten years ago into the National Association of State Universities. Presently with over 100 member institutions and a small but competent staff located in Washington D.C., the Association keeps the members informed of national legislation and programme developments affecting the Agricultural Universities, publishes a regular monthly news letter circulated to all members, conducts special studies, and provides other important services to its member institutions. Annual meetings are held when free and frank exchanges of views occur.

Accreditation in the U.S.

From its inception the Association in the U.S. did not consider it necessary to devise any specific accreditation agency for agricultural curricula, as has been often suggested to be done in some quarters in India. While not attempting to act as an

official accrediting agency, the Association in the US has emphasized, however, courses of instruction patterns that seemed to be most widely used and accepted. In the early years, curricula in Agriculture, Engineering, Home Economics and Veterinary Medicine received major emphasis, and more or less similar situation exists in India at present. Later as the institutions grew in the US, curricula in other colleges or divisions including various professional schools and Basic Sciences and Humanities came in for more and more consideration.

Agriculture was, however, from the beginning and still is a major component part of the Association in the U.S. Agricultural staffs of resident teachers, experiment station workers, and extension personnel together comprise the largest number of any of the major divisions. Though not functioning as an official accrediting agency for any agricultural curriculum, there is very much general agreement as to what are the essential subjects in the various agricultural curricula such as Agronomy, Agricultural Economics, Animal Husbandry and others for strong, satisfactory curricula both at the under-graduate and post-graduate level.

The situation is quite different from those in some other areas of instruction. For instance, the Engineers Council for Professional Development (ECPD) has been instrumental in the U.S. in strengthening the preparation of engineers for more effective overall performance in their profession and in modern society.* Accreditation of teacher preparation or teacher training institutions has also been practised in the US, but this has perhaps been one of the most controversial subjects. A more generally accepted method is to adopt university-wide accreditation as preferable to special subject matters accrediting agencies.

Informal University-wide Accreditation

There is no doubt that the informal but continuing and consistent influence of a strong organisation of Agricultural Universities constitutes one of the most desirable steps for assurance of sound and meaningful university-wide accreditation and quality performance.

* Ronald R. Renne—"Accreditation of Agricultural Institutions—A Note prepared for the First All India Conference on Agricultural Education" Oct. 21-24, 1969

In India also accreditation is a question that has been discussed on many occasions but with no prospect for a consensus. There is however no dispute as to the valuable role that an Association of Agricultural Universities can play in this regard. Qualitative planning followed by evaluation in the field of education with a determination towards change and progress are not always the strong points in a developing economy, and therefore, an Association could function as a watch dog to promote quality and work for progress.

Resource Constraints

When planning the work of establishing any university in India, it is often the case that the resources are decided by agencies other than those who plan the work. This introduces an element of uncertainty about the resources, and at times this leads almost to a gamble. There are a few Agricultural Universities in India which had run into serious difficulties leading to overdrafts, abrupt stoppage of building programmes and delayed filling up of sanctioned positions. Other Universities have played a more cautious role by planning within the framework of available resources, even if it resulted in slow implementation of the plan. Where the Universities fail to remain within the financial parameters determined by the ICAR (or Government of India) and the State Government, planning is bound to face difficulty and sometimes almost insoluble problems.

American Experience

The American experience of the Association of (Agricultural University) Land-grant Colleges would be of immense guidance to our endeavours to achieve our objective but it would not in any case be useful till it is modified and adjusted to meet the needs of the country. The organisation in USA is the outcome of an evolutionary process over a period of nearly seventy years (1887-1965). Dr. Arthur D. Weber who in the formative period of the Andhra Pradesh Agricultural University was in India as the Chief of the Kansas USAID team at Hyderabad has clearly set out the origin, growth, functions and working of the American Association of Land-Grant Colleges and State Universities. This analytical presentation of Dr. Weber has many

details of value but the more relevant and of direct and immediate concern to the Indian scene may be summarised as :

- (1) The American Association of Land-Grant Colleges has fostered the proper coordination of research, resident teaching and extension; it has served as a clearing house for all sorts of issues including national farm problems and depression problems. It has promoted close co-operation with the USDA.
- (2) The essential function shall be the consideration of questions relating to the promotion of higher education in all its phases in the universities and Land-Grant Colleges of the several states of the Union, and the discussion of such questions and the formulation of such plans, policies and programs as may tend to make the member institutions of the Association more effective in their work.
- (3) The association functions (a) to concentrate on common problems and not foster competition among member institutions. Its course should reflect the evolutionary processes which bring changes in the colleges and universities themselves; (b) to consider such of the questions relating to the promotion of higher education in all its phases—to make the universities more effective in their work; (c) the organizational structure of the Association should be in keeping with current needs and should reflect the current stage of university development in the country. Agriculture should have a prominent place at all stages.

Finally, the Association if effective, will influence the pattern of higher education outside the campus borders of its member institutions. The contribution of American Universities in this regard was summed up in these words by Sir Eric Ashby, Master of Clare College, Cambridge, England, in an address to the Centennial Convocation of Cornell University.

"A tide of academic influence now flows from West to East across the Atlantic. It is even seeping into the venerable cloisters of Oxford and Cambridge.

"Higher education open to all who are qualified and want it and a parity of prestige among studies which require a similar measure of discipline and concentration : these are the founda-

tions on which the American University has been built for a hundred years. Britain is laying similar foundations now, already there are signs that the American University is influencing the patterns of British University.....Today the influence of the American University outside the United States is massive and sustained".

The American Association of Land-Grant Colleges is financed by dues of \$500 per member institution plus \$75 per 1000 students or fraction thereof. The services were rendered free till 1946 when recruited include Executive Secretary, Treasurer, the Associate Executive Secretary and the Director, office of institutional Research. In India, as the preliminary organisational work would be heavy and of a complex nature, for some one to take interest and responsibility a paid executive secretary with secretarial assistance is the minimum necessary at the outset and it would be not only inevitable but prove prudent in the long run.

Indian Association of Agricultural Universities

Mr. C. Subramaniam former Union Minister for Food and Agriculture was among the first to commend the idea of inter-university effort among Agricultural Universities of India for developing inter-university project and courses placed an important suggestion for consideration.*

"I want to suggest for your consideration the development in our country of an organisation similar to what is known as the Committee on Institutional Cooperation (CIC) involving eleven different universities in the mid-west of the United States." The CIC was formed in 1958 to encourage voluntary cooperation in higher education among the universities. As a result of the exchange of ideas which CIC stimulated the universities have now been able to pool their resources in some areas and concentrate on developing special strengths. One of the pioneering concepts in higher education developed by the CIC is the "seed grant" policy, which provides small grants to inter-university faculty groups seeking avenues for cooperation. The seed grants serve the purpose of a spark plug and help to

*Annual Convocation address at OUAT Bhubaneswar (Orissa) December 26, 1966.

bring many more good ideas into the educational scene than otherwise could be possible. Special inter-disciplinary and inter-institutional programmes have been developed in many fields as a result of this project. An institution like CIC is particularly relevant to our conditions where we should strive to derive the maximum benefit for the community from our limited resources of both technical personnel and equipment".

The Association of Agricultural Universities in India though came into being on November 10, 1967, soon ran into rough weather mainly because of several problems. Instead of a desire for a united approach for mutual benefit, a tendency to promote individual interests emerged as a dominating characteristic in the context of scarcity of resources. Difficulties of adjustment in a small group seem also greater than in a large gathering, especially when individuals with strong partisan views are involved.

After a fairly long period of inaction, a spurt of activity by the Association became noticeable consequent to the election of office-bearers held in 1969 during the session of the First Conference on Agricultural Education in India held in Bangalore in October. This election became inevitable due to the illness of Mr. P.N. Thapar, the first President of the Association, leading eventually to his relinquishing the office of Vice-Chancellor, Punjab Agricultural University. The new office-bearers were :

Dr. M.S. Randhawa Vice-Chancellor, Punjab Agricultural University	President
Dr. K.C. Naik, Vice-Chancellor, University of Agricultural Sciences, Bangalore	Vice-President
Dr. S.R. Barooah, Vice-Chancellor, Assam Agricultural University	Secretary and Treasurer

Objects of the Association

Among the objects of the Association, the following are extracted as the major ones :

- (a) To formulate the pattern of future relationship between the Agricultural Universities and other bodies such as Indian Council of Agricultural Research, the Planning Commission, the University Grants Commission, the

- Council of Scientific and Industrial Research and various Ministries of the Central Government ;
- (b) To work out a model of appropriate relationship between Agricultural Universities on the one hand and their respective Governments on the other and by using its good offices in getting it accepted by both ;
 - (c) To co-ordinate whenever requested, the research efforts and resources of the Universities ;
 - (d) To provide opportunities for scientists in agricultural disciplines to hold meetings, seminars and workshops, to read papers and to publish journal or journals on professional matters of interest to agricultural scientists ;
 - (e) To provide liaison between Indian Agricultural Universities and allied institutions abroad ;
 - (f) To improve the contribution of the Indian Agricultural Universities to the development of economic and social conditions throughout India and in particular of the rural people.

First Convention

The convention of the Association of Indian Agricultural Universities opened on the campus of the Punjab Agricultural University, Ludhiana from February 23 to 27th 1970 was perhaps the first serious attempt to initiate action on the objectives for which the association came into being.* It was attended by delegates from nine agricultural universities as well as by the representatives of the Planning Commission, Indian Council for Agricultural Research, Ministry of Food and Agriculture and USAID. Apart from review of the problems of research, extension and education, it led to formulation of important ideas which, when implemented, would lead to better functioning of the agricultural universities in the service of agriculture.

Dr. M. S. Randhawa, Vice-Chancellor Punjab Agricultural University Ludhiana and President of the Association in his presidential address clearly set out some of the problems of immediate concern to the Agricultural universities which can only be solved by sustained efforts of the association. Briefly

*Report of the Vice-Chancellor, Annual Convocation March 18, 1970 Punjab Agricultural University.

relate to these :

- (i) Instead of setting up more central institutes some of the agricultural universities should be developed as advanced centres of learning and research with financial support of Government of India;
- (ii) For a purposeful functioning of the departments of agriculture and the agricultural universities their respective functions should be clearly redefined;
- (iii) There is at present no machinery for active collaboration of the autonomous agencies like Agro-Industries corporation, Land Development and Seed Corporation etc., with the State agricultural universities. This serious deficiency should be covered. A part of the profits of the agro-industries corporation and others may be used for financing research projects at the agricultural universities;
- (iv) The recent trend of private agencies to support specific research programmes at the agricultural universities deserves encouragement for development on an extensive scale;
- (v) The generous technical aid offered by foreign agencies in all its aspects should be continued on long term basis.

In the unanimity of the opinion of all that gathered that the problems listed need inevitable and immediate action if the agricultural universities concept and working is to sustain high rate of growth in agriculture and improvement in the lives of all Indians, lies the success of the first convention.

Future of the Association

As the agricultural universities move to maturity problems which appear peripheral may move to centre of the policy stage, while some issues that are the focal points of attention currently may begin to move towards the wings. Both the older problems and the new issues will continue to provide opportunities for leadership of each of these universities to plan for further

***Recommendations of the first convention of Administrative functionaries of Agricultural University in India by Association of Vice-Chancellors and workshop Punjab Agricultural University Ludhiana 23/26, February, 1970.*

growth. Financial resources, which at present appear difficult will, it is hoped, improve over time, enabling every institution to devote more time for strengthening teaching, research and extension services to become accepted instruments of agricultural progress. In the years ahead as in the past each agricultural university should be prepared to collide with old habits of mind, vested interests and determined non-changers on one hand, and continue to become the recipients of good-will and support from many agencies, on the other. Unless the resources are commensurate with the magnitude of the real and growing needs of each university, the task will ever remain difficult and the results unpredictable. But as important as financial resources are the human resources. These cannot be obtained for the asking. Each University and Nation has to create them or mould them. To the extent the quality of this particular resource is improved, to that extent will the future of these Universities could be assured and the goodwill and support of the Governments within this country and abroad, as also of other International Organisations, could be expected.

13. *Vice-Chancellor and Board of Management*

EDUCATION being the most hopeful of a nation's enterprises, the Vice-Chancellor of a university has enormous potentialities for good or evil. He could be the dominating influence in an institution or be a mere administrator like the General Manager of a factory. In the former capacity, the job could always be demanding and exhausting. In the latter case, his distance from the faculty and students could be considerable. If he is not a mature man of learning, his prestige may suffer before academic men. On the other hand, if he is not an able person of high position, his capacity as lobbyist and raiser of funds for the university may be low.

Vice-Chancellor

A university is sometimes said to be the lengthened shadow of its Vice-Chancellor. The institution is the result of mainly his wisdom and experience. Unlike other universities, the agricultural universities emphasize scholarship and the preparation of young Indians for active lines of service.

The Vice-Chancellor is primarily an executive officer and has an influence in the debates of the Academic Council and the Board. But he is not to be reckoned as an administrative officer and if so, he is duplicating the functions of the Registrar, Administrative Officer, Comptroller and Estate Officer. If he undertakes to do everything by himself, he is sure to end up doing but little and the little too not very well for an obvious reason that no officer would be willing to take the responsibility of placing any matter technical or administrative in its proper perspective to incur more of his displeasure and less or none of his gratitude. Vice-Chancellors who decide how many research papers each faculty member has to write for earning his annual increment or whether he can be given casual leave or not during

a semester or trimester, probing into details of expenditure on contingencies, pruning hot and cold weather charges for remote offices and the like can never give the leadership that the university would desire. The Vice-Chancellor's duty is that of general but vigilant supervision, application of correctives to misdeeds, plugging holes of leakage of prestige and honour, and to punish and remove the delinquents.

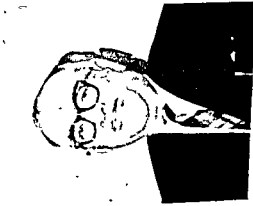
The success of a Vice-Chancellor has been stated to be more due to powers of exposition and persuasion combined with persistent industry, than to any force of will or habit of command. One-man power is apt to enfeeble or alienate those who are subject to it.

Many of the organisational adjustments and improvements may be extremely fragile until they become well bolstered by usage and experience. Continued leadership with supporting counsel and assistance during the critical early years is, therefore, highly important. On this ground, it is not possible to commend the provision for a three-year term to a Vice-Chancellor. A minimum of five years is considered desirable.

Scientist or Administrator as Vice-Chancellor

It is abundantly clear from global experience that it is not fair nor desirable to prescribe qualifications in a tacit way for the post of a Vice-Chancellor as qualities are more important and decisive for this crucial high office. All Vice-Chancellors of success and eminence in India or elsewhere could execute this high office with academic excellence by virtue of their intellectual ability, unimpeachable code of conduct, ingenuity and energy. There is no substitute for this in the foreseeable future.

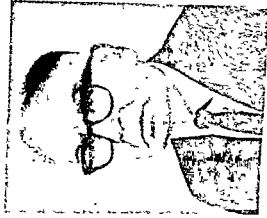
The question often raised is whether an administrator or an eminent scientist should be the Vice-Chancellor of an agricultural university, or any one who seems otherwise qualified and ceaselessly aims at it should be chosen. This is not only a difficult question but one who attempts to answer it objectively necessarily has to tread very dangerous grounds. The Vice-Chancellorship of any university much less an agricultural university should not go as a consolation prize to one who missed a bigger catch. If this were to happen, he would occupy the chair with a high degree of discontentment, which would be



Dr. K.C. Naik



Mr. O. Pulla Reddy



Mr. P.N. Tajar

Some founder and bullder Vice-Chancellors of agricultural universities



Dr. G. Rangaswami



Dr. J. S. Patel



Mr. D. P. Singh

Some founder and bullder Vice-Chancellors of agricultural universities

reflected in a greater measure on all aspects of the administration of the university.

The fact is that in the past all Vice-Chancellors, were drawn from the ranks of eminent educationists. They were always successful despite insignificant lapses. But currently the failure of a Vice-Chancellor is seen largely due to the quantum of political pressures placed and complexity of intrigues into which he is drawn. Under such conditions really eminent men have chosen to keep aloof in preference to "stick on" attitude of others. It is the latter that has aggravated the situation in which the students and administration interacted most unfavourably, turning seats of learning into virtual battle fields.

To have a scientist of eminence as the Vice-Chancellor of an agricultural university is to reap its own advantages. The most vital and all important one is that in the direction and speed of development of the university he would score very high, as he can always take quick and bold decisions and his top advisors cannot mislead him. The possible fear, though not remote, is that the university instead of having a balanced development may lean heavily toward a specific subject of his specialisation, while other supporting disciplines may suffer and may even pale into insignificance. If this could be corrected by timely checks and evaluations by expert committees, there can be no better choice than a technical man to head an university.

Even a proven administrator has to heavily lean on his technical advisors. These too may be prone to impress local prejudices on the Vice-Chancellor to the detriment and progress of the faculties. By the time the administrator realises or faintly doubts the genuineness of the advice, precious time may be lost and the internal weaknesses may develop into tragic proportions with loss of confidence and respect of the faculty members. The lost ground can be rarely, if ever recovered. The university under such conditions would be a drag on the exchequer.

Regents or Members of the Board

The Board of Regents or the Board of Management of an Agricultural University is more or less akin to the Syndicate of a conventional university. The members are drawn from different but related interests, so that individually and collectively

they contribute to the success of the cause and progress of an agricultural university.

If members of the Boards are unfit by training or inclination to deal with matters of education or are there to fight to the last ditch for *status quo* or for their own self-interests or for the interests of their supporters or friends, they cannot be fit to perform their duties. They will neither command respect nor can they enhance the reputation of the institutions, nor perform a social duty. Self-perpetuating membership of the Boards is equally unjustifiable. Only persons free from the political, commercial or class influences could perform the responsibilities of the Regents with justice.

The legal powers of Regents are almost similar though not identical in all Indian agricultural universities, but their actual part in the conduct of the institution varies greatly. This part assumes greater and perhaps a more dangerous significance in India when the Vice-Chancellor is not the President. The vital functions of the Regents that require clear recognition are two. First, the Board of Regents is to stimulate the Vice-Chancellor with their rich experience. The attitude of suspicious vigilance to safeguard the interests of a locality, sector or community rather than the interests of the university as a whole, has proved to be a lamentably bad system. The second is more important than the first, relating to the widespread practice among the employees in some universities to seek the help of Regents for gaining personal ends or to secure redress to some grievances—real or fancied. This is a most undesirable practice, which will promote indiscipline and encourage mainly the recalcitrants and slackers. Honest employees who disdain such a practice tend to suffer under such a system, and are virtually relegated to ineffective, frustrated groups.

Role of the Board of Regents

At the outset it must be emphasised that the progress of an Agricultural University is a collective responsibility of the Board of Management. Nevertheless it becomes necessary to indicate if not define, the duties of the Board members (individually and collectively) and of the Vice-Chancellor as the executive authority. As these Agricultural Universities are conceived on the model of Land-Grant Colleges of USA, it would be

appropriate to know the details of the system in vogue in USA itself.

In an address to the Board of Regents of the UAS at Bangalore, Dr. R.R. Renne, Chief of Party, University of Illinois expressed in clear terms the role of the Board of Regents.* His observations bear not only relevance but carry unquestionable authority and truth by virtue of his active participation and involvement for more than two decades, he was the distinguished president (Vice-Chancellor) of the Montana State University at Bozeman, Montana. He considers that the Board has five principal services or functions in the efficient operation of the university viz., *policy making, advisors to the Vice-Chancellor, protectors of the Vice-Chancellor and the University, effectiveness in securing adequate finances* and finally *effective participation* in all matters concerned with the affairs of the University. According to him, —“The principal role of Board Member is to formulate basic policies to govern operation and administration of the university. The Board with its membership representing a wide range of executive or management responsibility and experience, is in a position to be a very effective and helpful advisor to the Vice-Chancellor. A very frank and forthright relationship based on mutual confidence and respect between the Board and the Vice-Chancellor, is a favourable environment within which the Board can fulfill its advisory function most adequately. The Board can help to create favourable public opinion so that when executive action is taken, it will receive the approval and support of students, parents, taxpayers, and legislators so essential for successful programmes. The best Board Members are those who attend Board meetings regularly and whenever they possibly can, who prepare for the meetings by doing their home work (studying the agenda and supporting statements, etc., distributed to members prior to the meetings), with no personal axes to grind or personal glory or credit demands, dedicated to the fundamental aims of Agricultural Universities”.

*Address to the Board of Regents of the University of Agricultural Sciences, Bangalore and Vice-Chancellors of Indian Agricultural Universities, Bangalore, Mysore, October 23, 1969.

Relations with the Board

Some of the universities have during the short period of working, experienced occasional or even frequent disturbances to the unanimity and smooth working of the Board of Management. Some attribute this to the in-built friction in the Act itself. There is no uniformity about the choice of the Chairman of the board. In some cases the Vice-Chancellor is the Chairman of the Board but in others, one other than the Vice-Chancellor (a non-official member), is elected as the Chairman.

The relationship of the Vice-Chancellor with the Board of Regents or Management is of crucial importance. Either the Vice-Chancellor can be the first among equals or spokesman or leader of the faculty. In the former case, he assumes the power of representing and guiding the Board to arrive at sound decisions, while, in the latter case, he has to be always on the defence, a position never to be relished.

In any case the Vice-Chancellor as the executive authority is to carry out with faith and respect the resolutions of the Board when once they are passed, but on no account this work should be delayed or deferred. Either as Chairman of the Board or as one of its members, with erudite sense and vigour of argument, he has to brief the members to his point of view on any specific issue of dispute or difference of opinion. Should, he fail, there should be no residual effect on other issues or else the gene of vindictiveness may mutate to annihilate the institution itself or all that it stands for. Where the Vice-Chancellor is also the Chairman of the board, certain disadvantages may be noticeable. Firstly, the power and authority may get concentrated in one hand, so that the Vice-Chancellor would be virtually ratifying his own deeds. This would be the feature where the Board is weak or when some of the members, for their own selfish interests might align with the Chairman and become subservient to him. This would be a situation that can only result in total misgovernment. Where a high sense of duty to the country and the people is the predominant characteristic, it would be immaterial whether the Vice-Chancellor or any Regent acts as Chairman.

In the light of experience drawn from the history of the agricultural universities of India, it is possible to say that no

university in this country can flourish in which the Regents have not been willing to concede to the University officers the power, dignity and freedom. If the University officers are discouraged, embarrassed, and finally defeated by the conduct of the Regents, the institution cannot sustain its usefulness nor gain any renown. A University should rely upon its own ability and skill, rather than be guided by outside interference in managing its affairs. If it allows itself to be guided by a Regent or any other important individual, it will only injure itself, beside harming the cause of education. It would be appropriate to conclude "All laws are useless, for good men do not need laws at all and bad men are made no better by them".

14. Parameters of Teachers' Problems and Student Unrest

EDUCATION which essentially means transmission of knowledge has always been held in high esteem in all countries of the world. The literacy of a country is the yard stick for measurement of its prosperity. The various institutions and university centres, charged with the function of education accomplish this through men of high scholarship and talent and these are the teachers. The professor spearheads the community of teachers. Even affluent and highly literate countries of the world always complain of shortage of teachers and more recently as too inadequate to meet a part of the requirement.

The three segments that constitute a seat of learning are (i) the faculty (ii) the administration and (iii) the student community. In the past, the stature and eminence of the university was known only through the quality of the faculty. The administration which was always behind the screen exercising full control on the academic functions was in high esteem but quite recently ran into bad weather having lost its control and bearings. The most unfavourable reaction between the faculty and the student was on the stage when administration with a view to correct and control entered the stage but miserably failed. Obviously, the administrative machinery was sufficiently worn out in its principles to become effective. But it must be made clear that the administration by itself cannot be blamed, for, it was the victim of such peculiar circumstances arising out of phenomenal expansion of education distinctly disproportionate to its capacity.

Extreme dilution in quality of education and educational standards resulted from a variety of causes and appeared in the form of students' unrest. Eminent educationists and statesmen have examined it in some detail and assessed the situation. Thus Late Prof. Humayun Kabir said, "This is not a phenome-

non confined to any one country but is seen most acutely in the developing countries where the old order is yielding place to the new. One major cause of such turmoil is the confrontation of different cultures which has made it impossible for any intelligent person to conform completely to the traditions of his own civilization. The young are perplexed when they find that the values of one culture are often denied by others and in their perplexity they at times tend to deny all values".

A well-known Indian leader has said, * "The atmosphere in our universities and colleges is dulling to the spirit; at best, it is merely academic; at worst, it is that of a market place where recipes are sold for passing examinations". He adds that the student community has been given no ideal to work for that can lift them up from the mud of parochialism, casteism and provincialism and that can provide them with a channel for self-expression and adventure in living. He believes that the problem of countrywide student unrest, if it goes on recurring, would destroy not only the very edifice and with it the student community, but also destroy eventually the country itself. He affirms that unless remedial measures are found and adopted to remove the many educational deficiencies, it would be fruitless to blame the students for their predictable reactions to them.

It is not intended to discuss the subject in detail here but only to present such of those features of direct relation to agricultural university set-up. The possible ways and means of meeting the situation are also suggested.

Teacher—Past and the Present

In a typical university class room of developing nations professors appear in the class rooms at specified hours to read or dictate a material to be covered by the course. Text books are few, outside assigned reading is scarce, and class discussion is totally absent. As regards the attitude of the teacher towards the student, an authoritarian approach is not unusual, and is commonly justified to maintain order and discipline, but may also be with a view to protect the inadequacies of the teacher himself. The modern concept is that a teacher "is a stimulator,

* Jai Prakash Narayan—Convocation address, University of Delhi—December 23, 1966.

guide and interpreter in covering topic under consideration". Although he endeavours to cover large portion of the material, he seldom considers it as adequate, and therefore motivates the student for extra related reading. He is further keen to ascertain as to how best a student is able to follow and appreciate his endeavours.

Phenomenal expansion of education quite disproportionate to financial ability and manpower in the form of qualified teachers has largely been responsible in developing nations, for the deterioration of educational standards, and loss of honour and acclaim to the teaching profession as a whole.

According to Prof. Max Beloff* University teaching should be a full-time job. Seminars and conferences are certainly intellectually refreshing and stimulating, but this should not be at the expense of the daily grind of research and teaching.

A teacher who offers excuses that he is so busy with administration, committee work, serving on examination or selection boards, and travelling most of the time assessing the needs of other universities, so busy that he is unable to spare the time to lecture regularly, to take tutorials or to fraternise with his pupils, is really not doing the duty which should be his first consideration. And what the senior does, becomes only too often an example for the younger members of the faculty. Teaching, particularly university teaching, is no trade but a profession, even a vocation, calling for a three fold commitment; to the students' interests, to knowledge, and to the profession itself. Professor Max Beloff has rightly remarked that there are large number of university teachers with no commitment at all to the inculcation of knowledge or its expansion, and who are themselves inadequately equipped for the very difficult tasks of this generation of university teachers.

Writing of the Professorial elite in the USA, George Bundy says in the Atlantic Monthly : So far, unfortunately, professors have used their new powers, more for themselves as individuals than for their profession as a whole, let alone for the institutions in which they live... Even today the standard rhetoric of the united professoriate is more negative than positive, more fearful than assertive, more concerned with the

* Prof. Max Beloff—India International Centre, 2-12-1966.

individual rights and responsibilities of the professor than with the collective authority and responsibility of the faculty.

The common complaint—in India no less than in the USA or UK—is that the professor is usually more interested in personal “empire building” than in the tasks that should be the peculiar prerogative of his exalted position. Students come to college or university in a mood of singular expectancy. But soon, all too soon, disillusion overtakes them. Martin Duberman states that, “The lack of interest taken by most professors in most students their refusal to reveal or engage more than a small share of their own selves, have made many of the best students cynical about knowledge and about those who purvey it. They hoped to find in their professors models on whom they might pattern their lives. Instead, they find narrow specialists busy with careers, with government contracts and with the augmentation of status and income”.

World over, students have started complaining about the poor quality of teaching. The American student-sponsored Professor Evaluation Survey runs to several hundred pages and surveys the teaching of 600 professors with pretty downright outspokenness. In United Kingdom, in a recent report published by the National Union of Students, it is stated that nine out of ten students are dissatisfied with the quality of lecturing. The 20 lakhs of college and university students in India are unlikely to return a more flattering verdict on the quality of lecturing by our teachers.

It is not entirely the teacher's fault. There are other contributory causes—the promiscuous enrolment of students, the crowded classes, the outmoded curriculum, the stranglehold of the final examination, the baneful influence of the ‘coaching classes’ and the ‘bazar guides’—that cumulatively tend to diminish the role and effectiveness of the university teachers. But even, so the teachers cannot disclaim their responsibility. They haven't perhaps tried hard enough to make their teaching effective.*

A Good Teacher

Quite often the question is asked who is a good teacher. The performance of a teacher cannot be judged by any one

* Prof. K.R. Sreenivasa Iyengar, Swarajya, May 24, 1969. What ails higher education.

except the student. Reputed educationists have said that two kinds of men make good teachers—youngmen—and men who never grow old. One is only fit to teach so long as he is learning, and first class teachers in science are always sustained through stimulus given through research. Teaching and research are inseparable. Most of the successful professors abroad satisfy the above requirements and it is well reflected through their students who always exhibit a sense of pride of their association and scholarship under a professor. The secret of success of many institutions in advanced countries is the esteem and regard given to teaching profession as a whole. Universities and Institutions gain reputation through their professors but not by the building complex of their campus or by the administrative machinery at work. It is not unusual to find that professors continue to remain in the same institution and in the same position and even after retirement as Emeritus Professors.

A teacher should love his profession and this does not come through higher emoluments of pay alone. His professional competency effectively combined with excellent conduct in student training and evaluation, is a service to the community which few other professions can profess. He is the builder of the future and his mission is noble. His alignment with students for redressal of his grievances is mean and totally unwarranted. Should any one succeed that way, the monetary benefit is much smaller and short lived than the loss that can never be recovered.

Faculty Development

The development of a sound and energetic faculty being the major key to a successful university, the agricultural universities have to adopt and follow very carefully worked out plans and procedures to build this vital part. The system of selection by experts from outside the institution is probably the best method which could be devised. If the selection is left to the Boards, with no deep interest in education, they are liable to influence from ulterior motives, either sectarian, personal or political or parochial. With the autonomy enjoyed by most of the agricultural universities, the recruitment to the faculty has improved considerably.



**Earn while you learn demonstrated by students of UPAU, Pant Nagar.
A productive diversion for the young and a solution to student unrest**

The recruitment and selection procedures prescribed in one of the statutes are given below :

"The Selection Committee for these posts (Teachers) shall be comprised of at least three of the following members :

- (a) Three scientists or educators of not less than ten years experience, outside the university and fully conversant with the working of an Agricultural University of whom one shall be the Chairman.
- (b) Dean of the University.
- (c) Director of Instruction in the College concerned in the case of teachers, Director of Research in the case of research scientists, and Director of Extension in the case of extension personnel.

"The Selection Committee shall review applications for the post and consider the qualifications of all applicants including University Officers and other employees who may be qualified for the post. If a qualified candidate (s) is found, the Committee shall recommend in order of merit not more than three qualified persons for appointment".

Students' Unrest at Agricultural Campuses

The students' unrest at several of the agricultural universities may be the same as that of the conventional universities but in a much attenuated form and has its own peculiar features. Students of agriculture on a campus in contrast to their counterparts in conventional universities comparatively enjoy better physical facilities, and closer contact with the faculty and the administration. The training has its peculiar features, of outdoor field work, class room teaching, practical lab-work, frequent visits to cultivators fields, more educational tours and economic surveys and these helped significantly to reduce idle hours and kept the student deeply involved in the process of learning. A comparatively narrow student teacher ratio had a special advantage for free and frank discussions between the teacher and the taught.

A critical study of the unrest at some of the campuses is reported to have revealed that introduction of internal assessment system is the primary cause. This system was introduced in many agricultural universities before the teachers and the students could adopt themselves to it. The student soon found

that he had to put in not only much larger number of hours of study but maintain it uniformly over the entire trimester to meet the challenges of progressive evaluation. Even slight slackness on his part is reflected in a significant drop in his grade point. The demand for concessions in number and nature of examinations was the result. Better physical facilities on the campus, protest against corrupt practices, specific requests to dismiss certain delinquents, absence of any mechanism for redressal of grievances, uncongenial climate or atmosphere for a healthy corporate life to promote student growth and welfare and highly polluted atmosphere and unethical employment methods widely and frequently challenged in courts—all these added over twice to the catalogue of grievances.

If the conduct of a university is involved in an unpleasant debate in legislatures and publicised in the press, even in an attenuated form, no student would leave it without reading. A few of the students would not stop at reading but X ray it with the result the student community as a whole develops a scant respect to the faculties and the seat of administration. Even genuine approaches and dialogues between the student community and the University would prove to be ineffective. Experience has clearly shown, that so far as the student's affairs are concerned, promises without fulfillment and empty words and platitudes and hypocrisy have no place. Nothing is easier for the students to distinguish sincerity from insincerity and honesty for dishonesty. If the faculty members derive their strength from the University and not on their own competency and conduct the only period of peace for them would be when the students are on vacation. Discipline can only be brought with ease through the quality of the faculty supported by clean and earnest administration.

Student unrest in the developed countries is best explained in the words of a student leader who happens to be an American. He says*: "Our affluence enables us to assume less responsibility for our lives than did our parents for theirs in the depression, but our freedom encourages us to demand more responsibility".

*Naik, K. C.—Ways of tackling student unrest—Neglect of welfare work should be avoided MAIL—Daily published from Madras.

He and those of his persuasion believe that the world belongs to the young. It is, therefore in the fitness of things that they and not the old should have the freedom to regulate their future. In their view, the universities must be converted into laboratories for conducting experiments in the new life of their conception. All this is interesting but not strictly relevant to India where the problem of the young are not merely psychological. In this country students are being turned out by the educational institutions in their tens of thousands annually, not, as in the advanced countries, to be delivered to industry, business and Government but to swell the massive ranks of the unemployed numbering over twenty million.

Student of the Recent Present

The student of the recent present is a victim of peculiar circumstances. At least some of them were forced to take studies of a profession about which they have no pride. Their motivation at the lower level was inadequate and faulty. Their language proficiency is too poor to allow sufficient comprehension of the subjects of university instruction. Even parents openly confess of their limited or no influence for discipline of their boys. The unethical standards of picture houses have largely eroded the sense of values and morals of the young. The student is further demoralised by the feeling that even to get admission to an institution the help of a politician is necessary and politicians now have a disproportionate say in the university matters. Though this group of students constitutes a minority they have a profound capacity for organisation usually assisted by disgruntled politicians. They attempt to put forward acts of utter injustice of the administration, or the faculty members which come to their knowledge with amazing accuracy of detail, in a mysterious way. Some students said that no day passes off without an enquiry on some member of the faculty or administration but they are certain that the day on which the delinquent is to be punished never dawns. The students on one hand while all others on the other constitute two incompatible groups in the university and one can hardly expect peace under such agonising conditions.

Compassion and Code for the Student

The student community as a whole and the general public

do not seem to be appreciative of the basic factors involved in student unrest. These may be summarised as follows :

- (1) An Indian student as any one born in a developing country, cannot expect to have both quantity and quality at all levels of education.
- (2) If he is conscious of his rights and privileges, it is necessary that he should also be aware of his weighty responsibilities. It would be more appropriate for him to ask what he can do for the country rather than expect the country to do everything for him.
- (3) The student community, like any other section, can have no claims to be a privileged class, and has therefore to submit to law and order, so that the rights of every national is adequately safeguarded.
- (4) Students' legitimate role is to be observers of political changes of the country rather than active participants, expect of course when the nation is in danger and demands all citizens to do all they can to preserve national security and integrity. Their alignment with a political party would be premature and to the detriment of acquisition of knowledge and skills, which ought to be their mission.

Some Efforts to Arrest Student's Unrest

In 1955, the University Grants Commission put forward many suggestions, which included (i) the appointment of a Dean for student's welfare and (ii) Student counselling. A majority of Indian Universities have not implemented these suggestions. The experiences of the few of the universities that followed them is of interest.

(i) Dean for student's welfare

Neither student unrest nor welfare can possibly be tackled by the mere appointment of a Dean for students welfare. It could often be no more than an excuse for shifting responsibility or blame or both on one individual. To entertain hopes for a solution through such means would be to ignore the many sociological, educational and political factors involved. It would not be possible to work out a methodology of social change unless the creative springs in the university are fed. The student



At an impressive convocation young graduates with traditional academic robes—UAS, Bangalore



A new robbing pattern for graduates at a convocation—UPAU, Pant Nagar

is necessarily responsive to diverse aspects of a much wider and more complex social and cultural matrix. The stimuli from family, community and society as a whole are the most prominent of these.

(ii) Student counselling

Student counselling and frequent meetings between administration and student bodies could be very effective solvents for misunderstandings as well as for promoting identity of interests. It calls for a technique, "which can personalize the student's life and give him a sense of belonging, a feeling of relevance". The latest recommendations made by the University Grants Commission Committee of Students Welfare is that no college should ordinarily be allowed to have more than 1000 students, so that the community of students and teachers will be a manageable unit and opportunities for organised community life can be developed.

The working of student counselling could be illustrated by the experience of one of the teachers engaged in this work. This teacher is of the rank of an Assistant Professor. He is in charge of 20 students of the first year class of the Agricultural College, Hebbal, and all these students are under the trimester system of education subjected to internal evaluation. In accordance with the guidance issued by the university, he prepared a brief questionnaire to the 20 students and obtained particulars about them in order to understand the problems of each. He then contacted the students in the canteen, hostels, play fields, and their residences. If students failed to meet him on their own, he made the contacts himself. Probing into the problems of each under the broad headings of curricular, extra-curricular, personal and miscellaneous problems, he tried to find solutions or render such help as he could. In many cases, misunderstandings in the minds of the students were solved by patient discussion and explanations. In a few cases, a little improvement in hostel facilities was found possible through the intervention of the Warden or Director of Student Welfare. In a very few cases, the problems were such that they could be tackled only at the highest level, through the periodic meetings of the student body with the key officers of the university and the Vice-Chancellor.

of Agricultural Sciences, Bangalore in October, 1969. The general consensus was totally against it. This decision was based on the fear that student members might be used as tools by outside agencies and disgruntled elements within the university. The real issue is whether to change the personality of the youth or change the powerful forces of the society. The former is much easier of attainment than the later. Pressures from contemporary society may not all be easily amenable for institutional treatment; yet the student is the best available material for changing the traits of society. On this ground alone, whatever efforts universities can put in for changing the students attitude, outlook and conduct are definitely worthwhile. Investment on education towards these ends deserve the highest of priorities, if education is to be the foundation of good citizenship. Would it not be wise to follow what Elizabeth Cook has said "better build schools for the young than jails for the adults". More recently Lord Butler of Trinity College, Cambridge has observed "no modern country can solve its problems without investing more in people than in plants and guns. Higher education is a gateway to the success of national development. Expenditure on education is therefore important form of investment".

New Approaches to Solution

It would be sheer pessimism to pronounce that the students' unrest in India has no solution. The present day student is struggling under acute handicaps and deficiencies as reflected in poor quality of his hostel life and life at the educational institutions. He has therefore a legitimate feeling that he is being exploited in every way, for no fault of his. Poor financial investments by the university is one of the many directions to which attention needs to be focussed. Provision to train more graduates than needed for the prevailing economic set-up adds further to the dissatisfaction of students both while they are within the campus and after graduation.

That much of the present day training in most of the agricultural colleges is theoretical, is a fact. To make these graduates employable or confident of farming on their own, special measures are called for through curricular innovations, post-graduate practical offerings and apprenticeship courses.

Personality of the Vice-Chancellor

The deficiencies and errors on the part of the administration in many of the universities are only growth problems when an old order is being replaced by a new one. With experience gained, old order will give place to the desired healthy academic atmosphere. The success of the innovating agricultural university system requires highest integrity on the part of the faculty with a missionary zeal for service. The administration should be reasonable but firm, sympathetic but not corrupt, sincere but not pretentious, and above all not discriminatory on any ground. Under such conditions all problems are sure to be solved. To this end, the personality of the Vice-Chancellor becomes crucial.

An institution is shaped largely by the personal idealism or ambition of one man. It is the man taking initial risks who will be crowned with accomplishments. The institution's reputation is built on the basis of his personal efforts, on the plans he develops from day to day, hour to hour, and on his achievements. He could be "the innovating Ford or the organising Rockefeller" of the intellectual, educational or scientific world. His personal qualities like honesty, courage, clear thinking, dynamism and dedication are no less important than are his failures and successes in administering the institution that is largely his creation. The risk he takes may be a flop, the success he achieves may be chimeral, the support he has may be slender, but he should possess unlimited faith and courage in the cause to which he is wedded, if he is to persist in spite of all set-backs. This is the type of rule that the builders of these new institutions have to recognise. Any job small or big, any matter simple or complex, should have the touch of the Vice-Chancellor. His radiating influence should correct any thing that is going wrong any where and in this respect one should emulate the example of what Mr. John Gardner said when he resigned and left the USA cabinet in 1968 :

"There may be excellence or shoddiness in every line of human endeavour. We must learn to honour excellence (indeed, to demand it) in every socially accepted human activity, however humble the activity and to scorn shoddiness, however exalted the activity. An excellent plumber is infinitely more admirable

than an incompetent philosopher. The society which scorns excellence in plumbing because plumbing is a humble activity and tolerates shoddiness in philosophy because it is an exalted activity, will have neither good plumbing nor good philosophy. Neither its pipes nor its theories will hold water".

15. Recent Endeavours— *Outlook for the Future*

Any industry or enterprise, small or big needs evaluation at periodical intervals with a view to ascertain the measures necessary to improve the areas of deficiency so as to attain faster rate of growth towards maturity. Agriculture is no exception to this principle and USA has demonstrated it for emulation by others. In 1830 one farm worker in USA produced enough food and fibre for himself and only three others. One hundred years later he produced enough for himself and nine others. To-day one farm worker in USA produces enough food and fibre for himself and about 30 others. On the efficiency of crop production in USA it is known that while in 1939, 741 million bushels of wheat crop required 53 million acres of land, in 1963 as much as 1100 million bushels were harvested from only 45.3 million acres. It is necessary to add that while only about 7% of the population is engaged in agriculture no less than 60% of the people are engaged in business activity related to agriculture. This has defied very largely even the ancient scriptural writings in Kural*; "They only live by right that till the soil and raise the food. The rest are parasites". A large proportion of Americans are certainly no parasites but live in symbiosis with farmers—worthy example for others to follow.

India—After Independence

A few year's after attainment of political independence Indian agriculture was found to be quite inadequate in both quantity and quality. Briefly, Agricultural production attained an equilibrium, cultivable area was fully covered, rewarding inputs for crop growth were absent, and the rate of increase in

* Kural : Tamil Scripture. Swarajya May 31, 1969. "On Agriculture"
By C. Rajagopalachari.